PSYCHOSOCIAL PREDICTORS OF QUALITY OF LIFE POST MYOCARDIAL INFARCTION

VOLUME I OF II

I. GUL

PHD

2014

Psychosocial predictors of quality of life post myocardial Infarction

A prospective cohort study in Pakistan

Volume I of II

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Submitted for the Degree of

Doctor of Philosophy

Faculty of Health Studies

University of Bradford

2014

Abstract

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Title: Psychosocial predictors of quality of life post myocardial Infarction:

A prospective cohort study in Pakistan

Key words: Psychosocial predictors, quality of life, myocardial infarction (MI).

Introduction: The current study examined the psychosocial predictors (Type D personality, anxiety, depression & social support) in patients following MI. It further assessed the influence of these psychosocial predictors on quality of life of MI patients.

Methods: In this prospective cohort study, 300 patients with definite myocardial infarction were recruited and assessed at baseline (2 -8 weeks) post MI (time 1). Out of 300 participants 191 completed assessments at 9 months follow up (time 2). Type D personality was evaluated with Distress scale 14(DS-14). Depression and anxiety were assessed with Hospital anxiety and depression scale (HADS). Social support was measured with Social support scale (SSS), while quality of Life was assessed with WHO quality of life scale (WHOQOL-BREF) at time 1 and time 2.

Results: Analysis revealed that a significantly high percentage of MI patients had Type D personality characteristics, high levels of anxiety, depression and low level of social support. Type D personality and depression emerged as most significant predictors of quality of life after controlling for sociodemographic and clinical variables at time 1 and time 2 assessments.

Discussion & Conclusion: This research emphasized the importance of Type D personality, anxiety, depression, and lack of social support in risk stratification for adverse outcomes such as impaired quality of life. This research highlighted the need for a more personalized approach to therapeutic interventions along with medical treatment for the management and rehabilitation of MI patients.

Dedication

Dedicated to my family and friends

Acknowledgement

First of all I am grateful to God Almighty for giving me the courage and strength to complete this research.

This thesis would not have been possible without the contributions of several people who provided valuable support and guidance throughout the period of PhD studies. It is an immense pleasure to convey my gratitude to all of them in my humble acknowledgements.

First, I would like to thank the participants of the study for taking the time to answer the questionnaires and for sharing their personal information and experiences through the study interviews. This project would not have been possible without their participation and cooperation.

I would also like to express my gratitude to all the consultant cardiologists at Hearts International Hospital and Rawalpindi general hospital (Pakistan), and my research assistants for their constant support as without their cooperation, this study would not have completed.

I thank Fatima Jinnah Women University of Pakistan, and The Higher Education Commission for providing with this opportunity to carry out my academic work and providing the financial and practical support over the last four years.

I would like to extend my utmost gratitude to my supervisors Prof Rob Newell, Dr Caroline Plews, Prof Neil Small and Prof Maryann Hardy for their constant support, guidance, supervision and encouragement throughout this project. Their sound professional knowledge, expertise, commitment, and experience have helped me through all the stages. I could never ask for a better supervisory team.

I wish to express my appreciation to the Admin Team at the University of Bradford specially Rachel Gallagher for facilitating me at each and every step throughout my PhD studies. Special acknowledgements to my fellow PhD students for their encouragement, interesting academic discussions and moral/personal support.

I am extremely grateful to Prof Razia Bhatti Ali for her unwavering encouragement, counseling, constant support, and for believing in me throughout. She has always been there for me even during the most difficult times. This thesis would not have been possible without her support and motivation. She has been my strength and inspiration as I crossed all the obstacles in the completion of this research thesis.

I would like to thank Dr Jurgen Barth from University of Bern and Prof Johan Denollet from Tilburg University for sharing their research work and expertise. My thanks also go to Prof Girmay medhin from Addis Ababa University and Dr Adam Lund from University of Bath for their valuable suggestions on data analysis.

I am indebted to my friends (Sehar , sajida, shaheena)for helping me through the difficult times, and for all the, care, emotional support, academic suggestions, entertainment and hospitality which they provided throughout this period. Last but not the least; I want to thank my beloved husband and sons, for their encouragement, patience and support in this and other major endeavors of my life.

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ACS:	Acute Coronary Syndrome
AF:	Atrial fibrillation
AMI:	Acute Myocardial Infraction
ANCOVA:	Analysis of Covariance
AP:	Angina Pectoris
APA:	American Psychological Association
BDI:	Beck Depression Inventory
BP	Blood Pressure
CABG	Coronary Artery Bypass Graft
CAD	Coronary Artery Disease
CAQ	Cardiac Anxiety Questionnaire
CHD	Coronary Heart Disease
CHF	Chronic Heart Failure
CI	Confidence Interval
CR	Cardiac Rehabilitation
CRF	Corticotrophin Releasing Factor
CSM	Common Sense Model of Self-Regulation
CVD	Cardiovascular Disease
DALY	Disability-adjusted life years
DM	Diabetes Mellitus
DBP	Diastolic Blood Pressure
DS-14	Distress Scale 14
DSM-5	Diagnostic and Statistical Manual of Mental disorders
ECG	Electrocardiograph
ENRICHD	Enhancing recovery in Coronary Heart Disease
EuroQol scale	Euro quality of life scale
(LCGA)	latent class growth analysis
GAD	Generalized Anxiety Disorder
LVEF	Left Ventricular Ejection Fraction
LVF	Left Ventricular Failure

HADS	Hospital Anxiety and Depression Scale
HBM	Health Belief Model
HD	Heart Disease
HF	Heart Failure
HRQOL	Health Related Quality of Life
HPA	Hypothalamus-pituitary adrenal
HRV	Heart rate variability
ICD	Implantable Cardioveter Defibrillator
ICD-10	International classification of diseases-10
IHD	Ischemic Heart Disease
JFS	Joint Family System
MANOVA	Multivariate Analysis of Variance
MDD	Major Depressive Disorder
MOS_SSS	Medical Outcomes Study Survey of Social Support
MI	Myocardial Infarction
NA	Negative Affectivity
MLHFQ	Minnesota living with Heart Failure Questionnaire
NFS	Nuclear Family System
NICHD	National Institute of Cardiovascular and Heart
NRIs	nor-adrenaline reuptake inhibitor
NS	Non-significant
OS	Odds Ratio
PAD	Peripheral Arterial Disease
PCI	Percutaneous coronary Intervention
PHQ-9	Patient Health Questionnaire -9
PTSD	Post Traumatic Stress Disorder
QOL	Quality of Life
RCT	Randomized Controlled Trial
SBP	Systolic Blood Pressure
SD	Standard Deviation
SES	Socioeconomic System
SI	Social Inhibition

SPSS	Statistical Package for Social Sciences
SSAI	Spielberger State-Anxiety Inventory
SSRIs	Selective Serotonin reuptake Inhibitors
STAI	Spielberger Trait-Anxiety Inventory
SSS	Social Support Scale
TRA	Theory of Reasoned Action
TPB	Theory Planned Behaviour
TTM	Transtheoretical Model
Type D	Distressed Type
UOB	University of Bradford
WHO	World Health organization
WHOQOL	World Health Organization Quality of Life
WHOQOL-BREF	World Health Organization Quality of Life Brief Scale
WHO-ICF	World Health Organization's , International Classification of Functioning , Disability and Health

1 Introduction

1.1 Background of the study

This chapter presents a basic introduction about cardiovascular diseases, prevalence and risk factors associated with cardiovascular diseases. It also defines cardiovascular diseases such as myocardial infarction (MI) and psychosocial factors associated with it. Some of the significant psychosocial predictors related to MI such as Type D personality, anxiety, depression and social support are defined and introduced in this chapter. Basic information about quality of life post MI is also provided. The structure of the thesis along with an outline of other chapters is also provided at the end of this section.

Myocardial Infarction (MI) or heart attack is a type of coronary heart disease (CHD) which can cause a sudden death sometimes without indication of symptoms. However, various sociodemographic attributes, clinical characteristics and psychosocial factors may interplay to contribute towards the aetiology and progression of CHD. These factors also contribute towards adverse outcomes such as impaired quality of life, morbidity and mortality post MI. Shortly after the onset of MI, many patients experience psychological distress characterized by feeling of sadness, denial, anxiety and anger. Although the majority of these symptoms subside with time, a significant number of people continue to experience psychological distress several years after diagnosis; this subsequently affects the prognosis and quality of life for these

individuals (Mayou et al., 2000; Lane et al., 2002; Lauzon et al., 2003; van Melle et al., 2004; Dickens et al., 2007). A recent review of the literature identified other factors significantly associated with quality of life such as personality, social support and psychological distress in patients with CHD (Buneviciute et al., 2013; Staniute, 2013). Keeping in view the significance of psychosocial determinants, its impact on quality of life and scarcity of available evidence from Pakistan, it is very important to identify the psychosocial predictors associated with coronary heart disease. The cultural and societal factors play a crucial role in determining the trajectories of quality of life of individuals and therefore the present study was designed to explore these psychosocial predictors associated with MI in the context of Pakistani society. The study further examined the effects of these variables on the quality of life of patients with a diagnosis of MI after controlling for demographic and clinical variables. In Pakistan, rehabilitation programs for patients with CHD primarily focus on medical treatment and often ignore the significance of psychosocial predictors related with CHD.

In this research, a prospective cohort study was designed and conducted in two phases. Initially baseline assessment (time 1) was done at two to eight weeks following the first diagnosis of myocardial infarction. The same patients were reassessed at 9 months follow up (time 2).

1.2 Cardiovascular disease (CVD)

Cardiovascular disease (CVD) is a broad term used to describe “a range of diseases that affect heart and blood vessels” (Mendis et al., 2011). The various diseases that fall under the umbrella of cardiovascular disease include coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, and congenital disease (Mendis et al., 2011).The term cardiovascular disease is often used interchangeably with heart disease because both terms refer to diseases of the heart or arteries. Coronary heart disease is one of the most common types of cardiovascular disease.

1.2.1 Coronary Heart Disease (CHD)

Coronary heart disease (CHD) is a narrowing of the small blood vessels that supply blood and oxygen to the heart. It is also called Coronary artery disease (Gaziano et al., 2011). The most common conditions associated with CHD are Angina Pectoris (chest pain) and myocardial Infarction (heart attack).

1.2.2 Myocardial Infarction (MI)

Myocardial infarction (MI) is one of the most common coronary heart diseases. A heart attack or MI occurs when an area of heart muscle dies or is permanently damaged because of an inadequate supply of oxygen to that area. This lack of supply is caused by closure of an artery that supplies a particular part of the heart muscle with blood. This occurs 98% of the time from the process of arteriosclerosis ("hardening of the arteries") in coronary vessels.

Most heart attacks are caused by a clot that blocks one of the coronary arteries (the blood vessels that bring blood and oxygen to the heart muscle) (Weinrauch et al., 2008). The clot usually forms in a coronary artery that has been previously narrowed by the long term accumulation of atheromatous plaque, the condition called atherosclerosis (Berliner et al., 1995). Atherosclerosis is a complex pathological process which is characterized by narrowing of arteries due to the deposits of fatty material and cholesterol (plaque) over a long period of time. This reduces the flow of oxygenated blood from the lungs to heart thus increasing the risk of a cardiac event such as Angina Pectoris (chest pain). The atheromatous plaque can rupture and trigger the formation of a blood clot. A clot in the coronary artery interrupts the flow of blood and oxygen to the heart muscle, leading to the death of heart cells in that area. This causes the heart attack or myocardial infarction (Mendis et al., 2011).

The damaged heart muscle permanently loses its ability to contract, and the remaining heart muscle needs to compensate for it. Chest pain below the sternum (breastbone) is a major symptom of heart attack, but in many cases the pain may be subtle or even completely absent (“Silent MI”), especially in the elderly. The most common symptoms of MI are pressure in the chest, fullness, squeezing pain, pain spreading to shoulders, neck, or arms, light-headedness, fainting, sweating, nausea, dry mouth, feeling of "impending doom", seizures, fatigue, temporary loss of breath and low blood pressure (Weinrauch et al., 2008).

1.2.3 ***Prevalence***

Cardiovascular disease has been identified as the number one cause of death and was speculated to be a leading cause of death worldwide in both high and low income countries (Lopez et al., 2006). According to statistics provided by World Health Organization (WHO), approximately 17.5 million people died from cardiovascular diseases in 2005 representing 30 % of all global deaths. Of these deaths, 7.6 million were due to heart attacks and 5.7 million were due to stroke. Importantly around 80% of these deaths occurred in low and middle income countries (Callow, 2006). In 2011, WHO reports indicated that CVD remained the leading cause of death globally and it was speculated that by the year 2030, 23.3 million people would die as a result of cardiovascular diseases (WHO, 2011). According to global burden of disease estimates (Mendis et al., 2011) CVDs are responsible for 151377 million disability-adjusted life years (DALYs), of which 62 587 million are due to coronary heart disease. The disability-adjusted life year (DALY) is a measure of overall disease burden, attributed to number of years lost due to disability, disease or premature early death. The above mentioned statistics reflect the mortality and morbidity associated with CHD.

In the United States (US) an estimated 83.6 million are suffering from one or more type of CVD. Coronary heart disease is one of the most common types of CVD in US and the latest statistics have shown that 15.4 million people are diagnosed with Coronary Heart disease (Circulation, 2013). Out of these 15.4

million CHD patients, 7.6 million people suffered amyocardialinfarction and 7.8 million were identified with Angina Pectoris (Circulation, 2013).

Coronary heart disease (CHD) is one of the most common causes of death in UK. There are 94000 deaths each year in UK attributed to CHD and 1 in 7 women and 1in 5 men are reported to die from CHD (Scarborough et al., 2010). However death rates have decreased in the last 10 years by 45% for people less than 65 years of age. The reduction in death rate is due to better treatment facilities and primary and secondary prevention strategies (Scarborough et al., 2010). In a recent statistical report, Townsend et al. (2012) identified cardiovascular diseases (CVD) as a major cause of mortality in year 2010. In total 180,000 deaths from CVD, 80,000 deaths were attributed to coronary heart disease (CHD) in year 2010. However the incident of MI has decreased in all regions of UK except for North West (Townsend et al., 2012).

According to WHO (2011),more than 80% of deaths attributed to CVDs are reported in low and middle income countries. Research evidence has suggested that South Asian countries (i.e., India, Pakistan, Bangladesh, Sri Lanka, and Nepal) contribute the highest proportion of CVD deaths compared to other regions worldwide (Khan et al., 2006; Kumar, 2007) and it is estimated that the escalation of the CVD epidemic will be more rapid in Pakistan and India (Ranjith et al., 2005; Khan et al., 2006). Studies on the Indo-Asian region have also demonstrated that people are at increased risk of developing coronary heart disease in this part of the world (Gupta et al., 2006; Joshi et al., 2007). Research findings also suggest that cardiovascular diseases are one of the leading causes

of death in the Indo-Pakistan subcontinent (Lopez et al., 2006). Research by Jafar and his colleagues on the prevalence of cardiovascular diseases in Pakistan revealed that one in four people of less than 40 year of age may have CAD with women being a greater risk of developing heart disease than men (Jafar et al., 2008). Research evidence has suggested that although men in their 40s have a higher risk of CHD than women, However as women get older their risk increases so that it is almost equal to a man's risk (Mosca et al., 2007).

1.3 Factors associated with CHD

The aetiology and prognosis of CHD is multi-factorial, and several sociodemographic, clinical, behavioural and psychosocial factors contribute in the development and progression of CHD.

1.3.1 Sociodemographic factors

Age, gender, socioeconomic status (income, education and employment status) and marital status are some of the important sociodemographic factors associated with coronary heart disease. Research evidence has suggested that the prevalence of CHD is higher in men before the age of 75, however the prevalence is higher in women above the age of 75 (Allender et al., 2008). In the total 50,000 premature deaths due to CVD in the UK, 1 in 4 men and 1 in five women under the age of 75 died from CVDs (Scarborough, et al., 2010). Another study on gender related differences in CVD risk factors in urban Tanzania revealed that risk factors such as obesity, low HDL-cholesterol, and high level of glucose was more prevalent in women as compared with men.

However the odds (95%CI: 0.3-1.0) of having hypertension were 50 % higher in men as compared to women (Njelekela et al., 2009).

Recent research evidence has identified a significant association of sociodemographic variables with quality of life of patient with CHD. Cassedy et al (2013) reported that family income, being a proxy measure of socioeconomic status, had strong relationship with quality of life in cardiac patients. Rahimian-Bogar & Rostami (2014) also found that gender and socioeconomic status had a significant impact on quality of life of MI patients. In another study Mohammad et al.(2014) reported that high level of income, higher level of education, and being married had a significant association with health related quality of life (HRQOL). Education was identified as a significant predictor of physical health and age as a significant determinant of mental health (Mohammad et al., 2014). Hoe et al. (2014) also reported that marital status was significantly associated with HRQOL in patients with heart failure (HF) Mielcsk et al. (2014) reported that level of education was associated with impaired HRQOL in patients with chronic diseases. Patients with low level of education showed more impairment in HRQOL as compared to higher level of education.

1.3.2 ***Clinical & Behavioral factors***

Several population based epidemiological and prognostic studies have focused on the identification of factors associated with CHD. It is well documented that factors such as sedentary life style, smoking, certain personality characteristics

and emotional states significantly contribute towards the development and progression of heart diseases (Keil, 2000; Day, 2001; Smith &Ruiz, 2002).

A research study on Coronary Artery disease (CAD) risk factors and acute myocardial infarction (AMI) in Pakistan revealed a significant differences between young (<45 years of age) and old (>45 years of age) AMI patients. In a total sample of 976 patients, young AMI patients as compared to older patients were more likely to have hypertension, a family history of coronary artery disease, high cholesterol, high LDL and high triglycerides (Saleheen & Frossard , 2004). Another study looking at modifiable risk factors for MI, has documented nine risk factors which account for 90% of the population attributable risk in men and 94% in women (Yusuf et al., 2004). These nine risk factors were: abnormal lipids; smoking; hypertension; diabetes; abdominal obesity; lack of daily consumption of fruits and vegetables; absence of regular physical activity; alcohol consumption and psychosocial factors (stress, depression, marital dissatisfaction) (Yusuf et al.,2004;Anand et al.,2008). Other studies have also reported that behavioural risk factors for the development of CHD are cigarette smoking, diabetes, hyperlipidemia, and hypertension (Bonow et al., 2002; Lim et al., 2012).

According to the WHO, most CHD diseases like MI can be prevented by addressing risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, high blood pressure, diabetes and high cholesterol level (Mendis et al., 2011). A systematic review and meta-analysis of studies from 1966 till 2010 conducted by Huxley & Woodward (2011) revealed that the

relative risk ratio for developing coronary heart disease was 25% higher in women smokers as compared to men smokers, however the underlying behavioral and biological determinants of this difference was not identified.

A prospective cohort study undertaken by Jafary et al (2007) conducted in 17 coronary care units in all the provinces of Pakistan. A cohort of 1400 patents who presented with chest pain and were diagnosed with coronary artery disease (CAD) were assessed in terms of biological and behavioral risk factors. The results revealed that 68% of the patients were male and mean age of all the patients was 52.2 years Hypertension (55.2%), followed by smoking (52%), were identified as major risk factors. Diabetes and hyperlipidemia were also identified as significant risk factors for CAD (Jafary et al., 2007). The study highlighted risk factors for CAD and also the significance of preventive strategies. Mendis et al (2007) reported hypertension as one of the most common and significant preventable risk factor for premature death due to CVD.

Clinical factors such as disease severity also affect prognosis in terms of quality of life and mortality. Faller et al. (2009) reported that severity of heart failure negatively influences physical quality of life. In addition comorbid depression was an independent predictor of both physical and psychological quality of life. Smoking status was also identified as having a significantly adverse effect on the health status of patients with Heart Failure (HF). Smoking and health status was assessed at baseline and 1 year follow up. Current smoking status was identified as significant predictor of health status in patients with HF (Conard et al., 2009). Stafford et al. (2013) reported smoking as a significant independent

determinant of depression and impaired quality of life in CAD patients. Regarding comorbid physical diseases and quality of life, Sertoz et al (2013) reported that comorbid physical diseases especially hypertension had a significant negative impact on quality of life in Turkish patients following MI.

1.3.3 ***Psychosocial factors***

Previous studies have illustrated the role of psychosocial factors in the aetiology and prognosis of cardiovascular disorders. Research evidence in the past has revealed that certain negative aspects of personality such as anger and hostility are associated with stress-induced cardiovascular hyper-reactivity (Suarez et al., 1998) and are also independent risk factors for coronary heart disease (Miller et al., 1996).

Research evidence has also shown that personality characteristics, especially a Type “A” behavior pattern, play a significant role in the development and progression of cardiovascular diseases. Type “A” behavior is characterized by ambitiousness, aggressiveness, competitiveness, impatience, muscle tenseness, alertness, irritation, cynicism, hostility, and increased potential for anger (Friedman &Rosenman, 1974; Heilbrun, & Friedberg, 1988; Ragland, & Brand, 1988; Ursano et al., 2002). The findings of studies on Type “A” behaviour and cardiovascular disease have been inconsistent. Rosenman et al (1975) identified a significant relationship between a Type “A” behavior pattern and CHD in healthy middle-aged men. However Ragland &Brand (1988), in a 22 year follow up of Rosenman et al study (1976), reported that Type “A”

personality was not a significant predictor of disease progression. Due to the contradictory findings and lack of clear evidence on the role of personality in heart diseases, Denollet et al (1995) introduced the concept of distressed personality or “Type D” personality. The Type D personality construct is characterized by two stable personality traits called negative affectivity (NA) and social isolation (SI).

Research studies have also documented that negative emotions such as depression, anxiety, certain negative aspects of personality (Type D personality traits) and socioeconomic status may also have deleterious effects on cardiac functioning. These psychosocial variables might play a role as one of the precipitating factors for developing coronary artery disease (Van Melle et al., 2004; Denollet et al., 2005; Trigo et al., 2005; Nicholson et al., 2006; Frasure-Smith & Lespérance, 2008).Social factors, such as socioeconomic status (Steptoe et al., 2010), and social support may also play a significant role in the aetiology and prognosis of Coronary heart disease and MI (Burg et al., 2005: Barth et al., 2010). Leifheit – Limson et al., (2012) under took a prospective study exploring the impact of change in perceived social support on quality of life over the period of 1 year following an AMI. They found that low level of perceived social support was associated with poor quality of life in patients with AMI.

All the above mentioned sociodemographic, clinical, behavioural, and psychosocial factors play a significant role in the development, progression and

treatment of cardiovascular diseases such as MI. These variables also have a significant impact on quality of life in patients post MI.

1.4 Psychosocial factors and MI

The following section of this chapter presents a brief introduction to the psychosocial predictors (Type D personality, anxiety, depression & social support,) of quality of life being considered in the present research. The outcome variable (i.e. quality of life post MI) is also introduced in this section.

1.5 Type D personality and Myocardial Infarction (MI)

Studies have shown that psychosocial factors such as personality characteristics are associated with coronary heart disease (CHD) and have aetiological and prognostic implications. Certain personality traits such as negative affectivity (NA), which is characterized as the tendency to experience negative emotions, and social inhibition (SI), which is the tendency to inhibit self-expression in social interactions, may contribute to psychological distress and risk for CHD (Denollet 2000; Denollet & Brutsaert 2001). Research findings have documented that a combination of high negative affectivity and social inhibition combine to form a personality type which is referred as "distressed" or Type D personality. Individuals with Type D characteristics are at increased risk of long-term cardiac events (Denollet & Brutsaert, 2001).

1.5.1 ***Definition of Type D personality***

Denollet et al (1995) proposed the concept of distressed personality type or "Type D" personality to identify the role of personality in the pathogenesis of CVD. The Type D construct is characterized by joint tendencies to experience high levels of negative affectivity (NA) and social inhibition (SI). The individuals with Type D personality tend to experience increased levels of negative emotions and inhibit the expression of these emotions while avoiding social contacts with others due to the fear of how people may react.

Type D individuals generally have fewer personal ties with other people and tend to feel less comfortable with strangers. Denollet et al (1996) derived this model from the previous research evidence which suggested the significant association of social isolation and depression with adverse outcome in CHD patients. It was suggested that these personality traits of negative affectivity and social inhibition may be associated with depression and social isolation in these patients (Denollet, 1996). According to Denollet (2010) "*The Type D (distressed) personality profile refers to a general propensity to psychological distress that is characterized by the combination of negative affectivity and social inhibition".* "Negative affectivity (NA) predisposes a person to experience negative emotions across different situations and time, while social inhibition (SI) is characterized by inability to express emotions, lack of self-confidence and tendency to experience insecurity in social situation. Type D personality which a combination

of negative affectivity and social isolation can be measured using a standardized instrument i.e. distress Scale-14 (Denollet, 2005).

MI patients with Type D personality characteristics are at increased risk of future cardiac events compared to non-Type D patients (Denollet & Brutsaert, 1998). Pedersen & Denollet (2006) argued that Type D personality is associated with impaired quality of life, elevated levels of anxiety/depression and poor prognosis in patients with CVD independent of other biomedical risk factors such as disease severity. Other studies (Denollet & Pedersen, 2008; Marten et al., 2010) reported Type D personality as an independent determinant of adverse cardiac events and mortality in MI patients after controlling for disease severity and depressive symptoms. Mols et al., (2010) documented Type D personality and depression as independent predictors of impaired disease specific health status in patients with MI. Yu et al. (2010) found type D personality traits in 31% of CHD patients in China. Patients with Type D personality experienced high level of anxiety and depression as compared to non-Type D patients. In a cross-cultural analysis of Type D construct, Kupper et al. (2013) reported that Type D personality is a stable and universal personality type in patients with Angina, HF and MI, independent of disease severity. Type D personality is also associated with a higher prevalence of unhealthy lifestyles, hypertension, smoking, anxiety and depression.

Type D personality has not been extensively explored in Pakistan. Few studies have identified the prevalence of type D personality in patients with myocardial infarction. Saeed et al. (2011) examined the association between Type D

personality and quality of life in MI patients and healthy individuals in Pakistan. In this cross-sectional study 71% of MI patients and 33% of healthy controls were characterized as Type D individuals based on the scores of DS-14. MI patients with Type D personality have also been identified as experiencing high levels of psychological distress (Martens et al., 2008; Romppel., 2012) perceiving low level of social support and are less likely to engage in healthy lifestyles (Williams et al., 2008) or adhere to medication regimes post MI (Williams et al., 2011).

1.6 Anxiety and Myocardial Infarction

In addition to Type D personality, psychological distress such as anxiety and depression are also common in patients with myocardial infarction and may persist for months subsequent to an MI (Newman, 2003; Moser et al., 2007; Doering et al. 2010; Hafizullah et al., 2011).

1.6.1 Definitions of Anxiety

Jacobs & Jacobs (2004), define anxiety as: *"Characterized by an overwhelming sense of apprehension; the expectation that something bad is happening or will happen; class of mental disorders characterized by chronic and debilitating anxiety (e.g. generalized anxiety disorder, panic disorder, phobias, and post-traumatic stress disorder)"* (pg. 13).

Kaplan & Sadock (1996) state that anxiety "*is characterized by a diffuse, unpleasant, vague sense of apprehension, often accompanied by autonomic*

symptoms, such as headache, perspiration, palpitations, tightness in the chest, and mild stomach discomfort" (pg. 189).

From these definitions, it is concluded that anxiety is an unpleasant emotional state characterized by fearfulness and unwanted and distressing physical symptoms. It is a normal and appropriate response to stress but becomes pathological when it is disproportionate to the severity of the stress, continues after the stressor has gone, or occurs in the absence of any external stressor (Skapinakis et al., 2004).

1.6.2 ***Symptoms of Anxiety***

Anxiety symptoms can be classified into two broad clusters of symptoms (i.e. physical and psychological). The physical manifestations of anxiety may include a racing heart, tightness or pain in the chest, shortness of breath, headache, tingling in the fingertips, muscle pains, muscle weakness, dizziness, and difficulty in swallowing, abdominal discomfort, diarrhoea and frequent urination. The psychological manifestations of anxiety include irritability, anger, poor memory, inability to concentrate, fear of madness and fear of impending death (Boon et al., 1999).

According to Tyrer & Baldwin (2006) the psychological symptoms of prominent tension, worry and feelings of apprehension about everyday events and problems are common features of generalized anxiety disorder (GAD). The somatic symptoms of GAD are characterized by autonomic arousal (palpitation, sweating, trembling, dry mouth), chest and abdominal symptoms (difficulty

breathing, feeling of choking, chest pain, nausea), and general symptoms (hot flushes or cold chills, numbness or tingling, muscle tension, restlessness and inability to relax, difficulty swallowing).

A study in Pakistan suggested that 18% of the MI patients experienced depression, 14% anxiety and 18% exhibited mixed symptoms of anxiety and depression (Akhtar et al., 2008). Sarwar (2004) undertook a study to examine the relationship between anxiety, depression and social support in patients post MI. The analysis showed moderate to severe symptoms of anxiety in 64% of patients following MI. Bunevicius et al. (2013) reported significantly high levels of anxiety in Patients with CAD enrolled in cardiac rehabilitation programs. The high prevalence of the symptoms of anxiety in cardiac patients warrants the need for assessment and treatment of anxiety in these patients. Moser et al (2007) suggested that post MI anxiety should be given due consideration during clinical cardiac practice. Clearly, psychological distress such as depression and anxiety has detrimental effects on quality of life of MI patients.

1.7 Depression and Myocardial Infarction

Psychological Distress such as depression and anxiety is common in patients suffering from MI. Major depressive disorder (MDD) is currently the second most common cause of disability worldwide, after ischemic heart disease. However, by 2020, researchers believe MDD will be the leading cause of disability in the world (WHO, 2007).

1.7.1 ***Definitions of Depression***

The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) provides a cluster of depressive disorders which are characterized by "*the presence of sad, empty, or irritable mood, accompanied by somatic and cognitive changes that significantly affect the individual's capacity to function, issues of duration, timing, or presumed aetiology* " (American Psychiatric Association, 2013, pg 155) .

People often experience psychological distress (anger, sadness, guilt, anxiety) after being diagnosed with life threatening chronic diseases. These feelings usually lessen and subside with the passage of time. However, patients who keep on experiencing emotional distress may develop clinical depression.

1.7.2 ***Symptoms of Depression***

According to American Psychiatric Association's (APA), Diagnostic and Statistical Manual of Mental Disorders DSM-V (APA, 2013), major depression is characterized by the presence of at least five of the following symptoms for the period of two weeks. The symptoms are:

1. Depressed mood most of the day, nearly every day
2. Markedly diminished interest or pleasure in all, or almost all, activities
3. Significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day
4. Insomnia or sleeping too much (hypersomnia) nearly every day
5. Psychomotor agitation or retardation nearly every day
6. Fatigue or loss of energy nearly every day

7. Feelings of worthlessness or excessive or inappropriate guilt
8. Diminished ability to think or concentrate, or indecisiveness
9. Recurrent thoughts of death, recurrent suicidal ideation, or a suicide attempt or a specific plan for committing suicide.

(APA, 2013, Pg. 160-161)

Studies have shown that significant symptoms of depression are often present in patients recovering from a myocardial infarction (MI) and are associated with mortality and other CVD events (Frasure-Smith &Lespérance, 2003; Lauzon et al., 2003; Gottlieb et al. 2004; de Jonge et al., 2006).Clinically significant depression is present in at least one in five of cardiac patients (Rutledge et al., 2006). Steeds et al. (2004) reported that elevated levels of depression (47%) at baseline when assessed with Beck Depression Inventory (BDI) following MI. A study by Mary & Whooley (2006) has documented that depression is present in 1 in 5 outpatients with coronary heart disease and in 1 in 3 outpatients with congestive heart failure. Another study examined baseline depression and health-related quality of life due to acute myocardial infarction (Feuerbach et al., 2005) and revealed that depression was significantly correlated with overall quality of life and mental health.

Research in Pakistan revealed a high prevalence of depression in patients with MI. Sarwar (2004) found mild to moderate levels of depression in 56% of patients with MI. Assad (2004) also reported that 30% of MI patients experienced moderate and 18% severe symptoms of depression, 2 weeks post

diagnosis of MI. Khan et al.,(2012) identified clinically significant symptoms of depression in 30% of patients with HF.Khan et al. (2013) reported elevated level of depression in 27% of the patients with CAD in Pakistan. Meijer et al (2011) conducted a meta-analysis of studies published in last 25 years on the association between depression and post MI prognosis. They concluded that depression was consistently identified as one of the worst prognostic factors in MI patients. Psychological distress, such as depression and anxiety, has a detrimental effect on the quality of life of MI patients, affecting the overall quality of life (QOL) of these patients. Along with depression and anxiety, social support also affects the quality of life following MI.

1.8 Social support and Myocardial Infarction

A strong network of friends and family can have a therapeutic impact in the advent of a sudden stressful event such as heart attack or myocardial infarction. Social support plays a crucial role in the aetiology and prognosis of life threatening conditions such as myocardial infarction. A recent systematic review revealed a significant association between low functional support and prevalence of CHD in etiological studies and cardiac and all-cause mortality in the analysis of prognostic studies (Barth et al., 2010).

1.8.1 Definitions of Social Support

Social support is conceptualized, defined and measured as a multifaceted construct/concept. The concept of social support has been extensively studied.

However, different theorists have defined social support differently and there is a lack of consensus on its theoretical and operational definition.

Social Support can be defined *as* "*an exchange of resources between at least two individuals perceive by the provider or the recipient to be intended to enhance the well- being of the recipient"* (Shumaker & Brownell, 1984, p. 11). It can also be defined as "*a well-intentioned action that is given willingly to a person with whom there is a personal relationship and that produces an immediate or delayed positive response in the recipient"* (Hupcey 1998b, p. 313). Cobb (1976 p. 300) defined social support as "*information leading the subject to believe that he is cared for and loved, valued and esteemed, and a member of a network of mutual obligations."*

Cohen & Syme (1985) stated that "*the resources provided by the others can have either a negative or positive effect".* Lin (1986, p. 18) defined social support as *"perceived or actual instrumental and/or expressive provisions supplied by the community, social network and confiding partners*". In a recent systematic review and meta-analyses on social support and coronary heart disease, Barth et al (2010) identified social support as the total amount of support/aid an individual receives from and perceives in the social network. Dolbier & Steinhardt (2000) stated that traditionally, epidemiological research conceptualized social support in terms of marital status, interaction with friends/family and participation in social groups etc. However researchers in psychology have emphasized the contribution of cognitive appraisal or *perception* that one is supported by others when studying social support.

Research evidence (Norris &Kaniasty, 1996) has suggested that perceived availability and adequacy of social support is more important than the actual support available to a person. Consequently researchers (Lett et al., 2005; Barth et al., 2010) have identified two broad categories of social support (i.e. functional support and structural support). Structural social support is concerned with the existence and form of the social network, while functional social support is concerned with the efficacy of the network to provide different kinds of support (emotional, informational & instrumental) (Duru & Balkis, 2007).

Numerous studies have suggested that along with depression, social isolation and lack of social support are also associated with increased morbidity and mortality in patients following myocardial infarction (Berkman et al. 2003; Rosengren et al., 2004; Wang et al., 2005). Studies have shown that high levels of social support act as a buffer against the negative consequences of depression (Clin, 2000; Barefoot et al., 2003) and decrease depressive symptoms over the first year after MI (Frasure-Smith et al., 2000). Research evidence has also shown that the lack of a close confidant rather than depression prior to MI was associated with adverse outcomes post MI (Dickens, et al. 2004). Further lower social support at baseline has been identified as an independent predictor of recurrent events at 9 months (Pedersen, et al., 2004).

Recent research evidence has illustrated the role of social support in quality of life of patients with CHD. Barcutcu & Mert (2013) explored the relationship between social support in a crossectional study of Turkish patients (N=150) with

HF. The findings revealed that patients with high level of perceived social support had a better quality of life.

1.9 Quality of life and Myocardial Infarction

Clinical studies have shown that acute myocardial infarction (AMI) is associated with decline in the physical, social and psychological wellbeing and functioning of patients. These changes in quality of life (QOL) very often impair the patient's ability to perform even basic daily tasks (Westin et al., 1997; Brown et al., 1999). The assessment of quality of life in coronary heart disease is important as the goal of treatment and intervention is not only to reduce morbidity and mortality, but also to improve functioning, wellbeing and rehabilitation (Hillers et al., 1994; Thompson et al., 1998).

1.9.1 Definition of Quality of life (QOL)

Quality of life (QOL) is not a new concept. It was identified in Greek philosophy (McCorkle and Cooley, 1998). Aristotle described quality of life as happiness and a good life (Ferrans, 1990; Morgan 1992; Ferrans, 1996). Initially the concept was applied in the field of sociology, philosophy and economics (Mandzuk & Macmillan, 2005; Peterson & Bredow, 2009). In the recent years, quality of life has emerged as a significant concept in medical, nursing and health care literature. Research evidence and theory support the need for quality of life assessment in various disciplines associated with physical and mental health.(Frisch, 1998, Rotstein et al., 2000; Ager, 2002).

The phrase “quality of life” has become increasingly popular in the field of health care over the last few decades. The concept of “quality of life” might seem a straight forward and simple construct, including quality of life at individual level (e.g. better socioeconomic status, job satisfaction, good health, feelings of happiness/well-being) and at a collective level (prosperous communities and societies). However, disagreements and contradictions emerge frequently in the process of reaching specific definitions for quality of life. For instance, at an individual level, the significant determinant of the quality of life may be explained in terms of objective aspects of quality of life (e.g. good health, better life expectancy, high socioeconomic status) or subjective factors such as perceived social support, wellbeing and self-satisfaction. Similarly, at a collective level the concept of a “perfect society” has been a point of discussion among social scientists and economists for many years.

The significance of quality of life in health care research can be traced back to the work of the World Health Organization. Physical and psychological disorders have a major impact on quality of life (QOL) therefore assessment of QOL and its implication in health care services is an area of interest for WHO (Saxena & Orley ,1997). WHO (1948) emphasized the significance of quality of life in its definition of health as the *“complete state of physical, mental and social well-being and not merely the absence of disease or infirmity”*. This definition of health highlighted the importance of quality of life for health care professionals. The WHO QOL Group (1995, p. 1405) defines QOL as *“individuals’ perceptions of their position in life in the context of the culture and value systems in which*

they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships and their relationship to salient features of their environment".

1.10 **Health related Quality of life (HRQOL)**

The term ‘‘quality of life’’ is commonly used interchangeably with ‘‘health-related quality of Life’’ (HRQOL) (Varrocchio & Ferrans, 2010). Some researchers have preferred the term “health related QOL” over “quality of life” because the focus is on health.It can be used to measure the impact of illness and treatment strategies on an individual (Roebuck et al., 2001) and the impact of different experiences and treatments for the same condition or the impact of different treatments across different conditions (Thompson & Roebuck, 2001).Health-related quality of life (HRQOL) is generally defined as the extent to which perceived health, or changes in health, have an influence on an individual’s physical, psychological, and social functioning (Bowling, 1997; Drummond et al., 2005). Researchers and theorists have identified three important characteristics of HRQOL. HRQOL has been defined as a temporal, multidimensional and subjective construct (Peterson & Bradow, 2009).

Mandzuk & Macmillan (2005) in the concept analysis of QOL highlighted the three critical attributes based on a literature review to further illuminate QOL. These attributes were: (1) individuals make a subjective appraisal of their own lives; (2) individuals identify their satisfaction with their lives as it pertains to the

physical, psychological, and social domains of their life, and (3) objective measures may supplement people's subjective evaluations of the QOL. They elaborated that an individual's subjective evaluation plays a significant role, however the objective assessment such as socioeconomic status and education may also contribute towards QOL (Marshall, 1990; Lee, 2002 as cited in Mandzuk & Macmillan, 2005). It was further stated (Mandzuk & Macmillan, 2005; Hays et al 2009) that general health and functioning is included in the physical domain, while the psychological domain encompasses personal satisfaction, spirituality, and feelings of wellbeing. Social support and networks, family and friends and feelings of belonging to a community or group are included in the social domain of QOL (Mandzuk & Macmillan 2005)

Numerous research studies have reported QOL as a multidimensional construct (Ferrans & Powers, 1992; WHOQOL Group, 1995; Efficace and Marrone, 2002; Cimete et al., 2003; Kaasa& Loge, 2003). Some Researchers (Padilla &Grant, 1985; WHOQOL Group, 1995) have identified HRQOL in terms of physical, psychological, social and environmental domains. Others (Blumenthal & Mark, 1994) reported HRQOL as physical functioning, emotional status, cognitive performance, social functioning, general perceptions of health and well-being, and disease- specific symptoms.

HRQOL is temporal in nature and patients have the ability to change their perceptions and set their own priorities in term of quality of life on the basis of their experiences in everyday life (Peplau, 1994; Sprangers & Schwartz, 1999). Factors such as culture (Marshall, 1990; Collinge et al., 2002; WHO, 2004) and

spirituality (Efficace & Marrone 2002; Horton 2002) have a significant influence on people's perception regarding their QOL. Research evidence supports the subjective nature of QOL and HRQOL depending upon patients' perspectives and their subjective feelings (Ager, 2002; Collinge et al., 2002; Hacker, 2003).

Rosen and colleagues (1997) examined whether emotional distress, social support, and physical functioning, together with socio-demographic and clinical variables, could predict subjective global health in patients with left ventricular dysfunction. They found that socio-demographic and clinical variables had no, or only indirect, effects on quality of life. Social support and emotional distress were identified as significant determinants of physical functioning. A research study by Westin et al (1997) illustrated that patients with cardiac problems often experience impairment in quality of life and given that psychological distress has a negative impact on quality of life, this therefore has implications for rehabilitation of these patients. Research findings have also demonstrated that quality of life of an MI patient is more impaired than general population (Brown et al., 1999, Schweikert, 2009).

Recent research evidence has suggested that psychosocial factors such as Type D personality, (Mols et al., 2010; Middel et al., 2013) anxiety , depression (Stafford et al., 2007; Faller et al, 2010; Beek et al., 2012) and social support (Heo et al., 2012: Chung et al.,2013) have significant impact on quality of life of patients with CHD.

Saeed et al (2011) reported that MI patients with Type D personality have more impaired quality of life compared to non-Type D patients. Type D personality, depression, and anxiety were identified as significant predictors of impaired quality of life in patients with MI (Gul, 2010) in Pakistan. Sertoz et al.(2013) undertook study to examine the effect of comorbid medical disease and depression on quality of life of MI patients in Turkey. Depressive symptoms and comorbid diseases were identified as significant determinants of quality of life post MI. In another study Faller at el. (2009) also found depression to be an independent predictor of impaired HRQOL in patients with chronic heart failure (CHF).

Vinod and Christopher (2014) conducted a systematic review to explore the relationship between social support and outcomes in patients with cardiac diseases. They concluded that increased in the levels of social support is associated with a decrease in the symptoms of anxiety and depression and improvement in the HRQOL. Arestedt et al (2013) also reported significant association between social support with HRQOL, specifically the emotional aspect of HRQOL, in patients with CHF.

In the current research the terms quality of life (QOL) and health related quality of life (HRQOL) were used interchangeably. Identification of specific psychosocial factors and its impact on QOL of MI patients would highlight the importance of routine screening of patients for Type D personality, psychological distress, and lack of social support which would be beneficial in responding to the specific treatment needs of the patients.Furthermore therapeutic

interventions and rehabilitation programs may incorporate these psychosocial factors for the treatment and management of patients with MI.

1.11 Structure of the thesis

The thesis is divided into 6 chapters including this background section.

1.11.1 ***Chapter 2: Literature review***

In chapter 2 the empirical and theoretical literature related to sociodemographics, the clinical and psychosocial predictors of MI such as Type D personality, anxiety, depression, and social support are extensively reviewed. The relationship between these psychosocial factors and myocardial infarction is also explored. Aetiological and prognostic studies related to each of the above m*en*tioned psychosocial variables and CHD, especially myocardial infarction, are critically reviewed. The impact of these variables on quality of life of MI patients is also examined and relevant literature is thoroughly explored. The novelty and significance of current research with reference to Pakistani culture is also reported in the light of this extensive literature review.

1.11.2 ***Chapter 3: Theoretical framework***

The chapter starts with an overview of some of the significant theoretical models that explain the health and illness behaviour patterns. After reviewing the general models, specific models related to quality of life are discussed. After the critical overview of the existing models, a guiding theoretical framework for the current study is provided at the end of this chapter.

1.11.3 ***Chapter 4: Methods***

Chapter 4 describes the research methods in detail. The argument for the purpose and rationale of the present study is presented at the beginning of the chapter. The main aim and objectives of the study are described. It also presents the preliminary feasibility analysis for the research which was conducted to assess the availability of a sample and other methodological practicalities associated with the administration of the questionnaires/scales, recruitment of the participants and data collection procedures. It also gives a description of the study design, study setting, sampling procedure and assessment tools used to measure predictor and outcome variables. Ethical consideration such as ethical approval, confidentiality of the data and other related issues are also examined. The proposed methods of statistical analysis along with details about the basic assumptions for the statistical test used are also described in this chapter.

1.11.4 ***Chapter 5: Analysis & Results***

The baseline demographic and clinical characteristics of the sample are described. Descriptive statistics are used to identify Type D personality, levels of anxiety and depression in MI patients. Correlations, means and standard deviations (SD) are calculated for each variable for time1 (2 to 8 weeks) and time 2 (9 months) assessment in a prospective cohort of MI patients. A series of regression analyses are conducted to identify the significant determinants of quality of life at baseline and follow up. Underlying assumptions are inspected for each model. T test was used to assess the differences between time 1 and

time 2 assessments in terms of psychosocial variables (type D personality , anxiety ,depression & social support) and quality of life. Differences between subgroups such as Type D and non -Type D individuals and gender are also examined.

1.11.5 ***Chapter 6: Discussion & Conclusion***

Chapter 6 presents the main discussion of the research findings and results. The results are extensively discussed and evaluated with respect to the aims, objectives and hypotheses of the present research. The study findings are explained in the context of the wider research literature based on supporting and contradicting research studies. The novelty of the research findings with reference to Pakistani culture and its implications for research and clinical practice are also discussed. The chapter concludes with an overview of the strengths and limitations of the research along with suggestions for future studies in this field.

2 Literature Review

This chapter of the thesis is focused on the literature pertaining to the socio-demographic, clinical and psychosocial predictors for MI and quality of life post MI. An extensive review of research conducted in the past few decades has been carried out to examine some significant biological, individual and psychological factors which increase vulnerability for cardiac disease as well as psychosocial implications which impact prognosis, treatment outcomes and overall quality of life in patients with heart failures, coronary artery bypass grafting (CABG), and specifically in patients with MI. An inductive approach was followed to review studies appearing in Science Direct, Sage, Ebsco, Pub-med, PsycInfo, Medline and British Library ETHoS (electronic thesis online service). The key words used to search the relevant literature included ‘patients’, ‘myocardial infarction’ ‘coronary heart disease’, ‘heart failures’ ‘CABG’ . These words were used in conjunction with ‘risk factors’ ‘predictors ’,‘ disease severity, co-morbid illnesses, smoking status, quality of life’ anxiety and depression’ social support’ and Type D personality. These studies were critically reviewed considering their aim and objectives, methodology, findings and clinical implications. Meta-analysis, systematic reviews, randomized controlled trials were also reviewed with respect to the above-stated areas. Studies from different countries and cultures have been included thus providing a broad overview of the existing evidence. In addition to this it identifies the existing gaps in knowledge and scientific evidence which subsequently provide a strong

rationale and support the significance for this study, particularly with reference to Pakistani culture.

The literature review is divided into three sections. The first section provides a review of the literature related to sociodemographic variables that might be associated with cardiac disease .It further examines the interaction between these sociodemographic variables in terms of quality of life of MI patients. The second section provides a review of clinical and behavioural factors related to coronary heart disease and their relationship with quality of life in these patients. The third section provides review on psychosocial factors associated with coronary heart disease and their relationship with quality of life in these patients. A summary table of the studies for each psychosocial variable (Type D personality, anxiety, depression & social support) is presented.

2.1 Sociodemographic variables and CHD

Existing literature (Emery et al., 2004; Raine et al., 2002) has suggested that some demographic variables such as gender, age, education, occupation, income and marital status may be associated with a higher risk for CHD. The interrelationship of these variables might result in further risk of the disease itself and negative outcomes. It is a common observation that females, in traditional societies like Pakistan, with low educational qualification and unemployed status are associated with poor quality of life which consequently increases their risk for certain health problems including cardiac illnesses. Muhammad et al. (2014) demonstrated that lower levels of education and high levels of depression

associated with poor physical health, while increased age of patient, high levels of anxiety, and depression predicted poor mental health. A study conducted in Pakistan (Aziz et al., 2008) showed that overall prevalence rates of cardiac disease was 6.2% with women older than 30 years of age having a significantly increased risk of heart attack compared to men (8.2% versus 4.5%). The prevalence of stroke in women was 3.5% which again was higher than men (1.8%). These findings clearly suggest that prevalence of heart disease is higher in women than men in Pakistan. Another study (Bokhari et al., 2002) conducted in a tertiary care hospital setting, examined the prevalence of depression in patients with heart disease and reported that female patients were at increased risk of negative psychological outcomes (depression) in these patients. However a population based study by Jafar et al.(2005) found equal prevalence of depression in both men and women. In contrast to this a study by Jafary et al. (2007) reported that the majority (68%) of patients who presented with chest pain complaints to emergency departments were males. These mixed findings on the subject matter suggest further exploration is required as very few studies have been conducted in Pakistan. Kristofferzon et al. (2005) conducted a systematic review of studies published in the early and mid 90s (Hamilton & Seidman, 1993; Brett & Madans, 1995) and observed mixed results in terms of gender differences in prevalence, symptom presentation, access and response to treatment.Gender differences other than prevalence and symptom presentation have also been examined in context of social support (Kristofferzon et al., 2005), coping (Bogg et al., 2000) and determinants of quality of life (Brink et al., 2002). Kristofferzon et al. (2005) found that women with MI reported more

perceived social support than men and coping strategies used by women were different than men. They also reported insignificant gender differences in terms of quality of life. However, a study by Martin (2012) demonstrated that patients with cardiovascular disease (CVD) generally reported a poorer health-related quality of life (HRQOL) compared to healthy age and gender-matched individuals. In addition, Martin (2012) found that female gender appeared as an independent predictor of lower health related quality of life scores with females reporting more preoperative co-morbidities compared to males at both baseline and six months which is likely to have an impact on recovery time and outcomes. This study suggests that efforts should be made to identify and treat female patients with CVD earlier to improve post-surgical outcomes. Petterson et al. (2008) conducted a study in Norway to determine the relationship between sex and health-related quality of life following myocardial infarction as the exiting literature at that time was contradictory. They found that women scored lower than matched control norms on physical functioning, general health, and role functioning as assessed using different physical and mental well-being measures. In contrast, men scored higher on bodily pain. The authors concluded that men and women had different determinants of HRQOL.

A prospective cohort study was undertaken by Jafray et al.(2007) in 17 coronary care units in all the provinces of Pakistan a cohort of 1400 patents who presented with chest pain and were diagnosed with coronary artery disease (CAD) was assessed in terms of risk factors, family history and other co-morbid conditions. The results revealed that 68% of the patients were male and mean

age of all the patients was 52.2 years. A study (Njelekela et al., 2009) on gender related differences in CVD risk factors in urban Tanzania revealed that risk factors such as obesity, low HDL-cholesterol, and high level of glucose was more prevalent in women when compared with men. However the odds (95 %CI: 0.3-1.0) of having hypertension were 50% higher in men compared to women (Njelekela et al., 2009). Haitjema et al. (2014) examined HRQOL and the association with outcome during follow-up in a population undergoing surgery for peripheral artery disease or cerebrovascular large artery disease. They reported that HRQOL is poor and does not associate with CVD burden within patients suffering from severe atherosclerotic disease. Limited research is available on the difference in coping styles of males and females as well as the physical after effects on both genders of MI, post trauma. Those studies that are available, however, point to different coping mechanisms for both genders in terms of life after MI (Caulin-Glazer et al., 2001; Chan et al., 2005). Findings also indicate that females are at a greater risk of non-referral following rehabilitation after MI compared to males (Caulin-Glazer et al., 2001; King et al., 2001). These studies also indicate that due to various psychological reasons such as self esteem and ability to cope, female patients are at a higher risk of not completing their rehabilitation treatment compared to men (Yohannes et al., 2007). This review indicates that gaps exist in terms of generating adequate evidence about patterns of gender differences in terms of prevalence, presentation of symptoms, access and response to treatments as well as association between specific risk factor and determinants of quality of life of MI patients of both genders. The psychosocial conditions in South-Asian countries have an impact

on women lives from various dimensions thus further highlights the need to investigate the relationship between these variables and quality of life in MI patients. Other socio-environmental factors that have a significant effect on post MI HRQOL include the age, marital status of the patient (Farley et al., 2003; Husak et al., 2004; Shanks et al., 2010; Yohannes et al., 2007), education (Chan et al., 2005; Shanks et al., 2010), work status as well as the ability to rejoin work post trauma (Chan et al., 2005;Hagan et al., 2007) and income levels (Shanks et al., 2010).

Studies have shown (Beck & Offenbetcher, 2001; Conn et al., 1991) that age is an important factor which might affect health related quality of life in MI patients. A research study by Saleheen & Frossard (2004) on CAD risk factors and acute myocardial infarction in Pakistan revealed significant differences between young (≤45 years of age) and old (>45 years of age) AMI patients. In the total sample of 976 patients, young AMI patients were more likely to have hypertension, a family history of coronary artery disease, high cholesterol, high LDL and high triglycerides (Saleheen & Frossard,2004) compared to older patients. Pettersen et al. (2008), while discussing findings of their research identified a relationship between young age and improved treatment response which is supported by previous research (Bengtsson et al., 2004; Wolinsky et al., 1998). Studies in South Asian countries have found population susceptibility to acute myocardial infarction (AMI). A study designed to evaluate the association of risk factors for AMI in native South Asians, especially at younger ages, compared with individuals from other countries. The result supported that the mean age for first

AMI was lower in South Asian countries (M=53.0; S,D.=11.4 years) than in other countries (M=58.8; S.D.=12.2 years) indicating that in South-Asian communities, people of young age are at increased risk for heart diseases (Joshi et al., 2007). Health-related quality of life (HRQOL) has also been identified as a predictor of survival in patients with CAD and heart failure (Westin et al., 2005). A significant relationship was also found between HRQOL and myocardial Infarction (Bengtsson et al., 2004). Results revealed that HRQOL of MI patients with in the age group <59 years was more impaired compared to older patients (≥59 years) even after 2 years following a myocardial infarction (Bengtsson et al., 2004). Abdelmoneim, (2014) conducted a prospective cross-sectional observational study in Egypt aimed at reporting the demographics of Acute Coronary Syndrome (ACS) and made some contradictory observations. This study demonstrated high prevalence of ACS in younger age group and that male gender, smoking and family history of similar disease were significant risk factors.

In addition to gender and age, socioeconomic status (SES) is a significant determinant of CHD worldwide (Fiscella & Franks, 2004). Socioeconomic status (SES) identifies a person's hierarchal place in a society by referring to his/her education, occupation and income which ultimately determine an individual's living standards and progress. Rao et al. (2003) specifically examined the income-based disparities in healthcare processes and outcomes in patients with acute coronary syndromes. Patients in this study were grouped into low, middle, and high-income categories based on the USA. Census bureau definition of

poverty. The results revealed that low-income patients had more chronic medical conditions. Further among low-income patients, the use of some evidence-based medications and cardiac procedures was lower and the unadjusted rates of 30-day death and six-month death or MI was higher. After multivariable adjustment, there was no consistent pattern for disparity in care processes, but the trend for higher short and intermediate-term death or MI persisted for low-income patients. Graham (2006) looked into the role of socio-economic position in health inequalities and suggested that socioeconomic position affects health indirectly by influencing environmental risks (e.g. poor living conditions, increased vulnerability for occupational hazards, traffic danger etc) and psychosocial factors (e.g. poor social support from family, stressful life events). Fiscella & Tancredi (2008) identified some clinical, psychosocial, and behavioral factors that play role in mediating the relationship between SES and CHD. Denvir et al. (2006) reported that low SES was associated with more re-admissions and poor quality of life in patients with CHD. Shishehbor et al. (2008) conducted a study on patients at risk for developing CHD and found an independent relationship between lower SES and poor involvement, as well capacity, to perform physical exercise which consequently increased the risk for mortality. Low education, occupation status and income very often limit access to a healthy diet, knowledge and affordability of treatment procedures and place people at greater risk of engaging in unhealthy behaviors (smoking, alcohol abuse). This may also lead to poor compliance with treatment procedures and thus influence prognosis. (Fiscella & Tancredi, 2008) This situation is more pertinent with reference to South-Asian community where people are in general

more at risk for poor health conditions attributable to poor demographic and economic conditions as well as influence of cultural factors that may determine health related attitudes and behaviors. Similarly Mielck et al. (2014) reported that people in lower SES groups are exposed to an increased burden of ill health primarily due to their increased vulnerability for health complications and deteriorated quality of life. This review, based on several years of research, has shown socio-economic status to be strong determinant of poor health conditions and quality of life in MI patients.

Mortality rates have been linked with marital status and other social networks suggesting beneficial effects of social support on long and healthy life (Schwarzer & Reickmann, 2002). Family systems and marital status are also assumed to be a strong determinant of HRQOL in South-Asian societies as both are a major source of social support systems in collective societies. A cross-sectional study was carried out at the out-patient clinics of the Aga Khan University Hospital, Pakistan. Researchers explored participants' levels of satisfaction with current family system, opinions about changing trends in family systems, and its implications on health. Four hundred people aged 65 and above were interviewed. 56.5% were living in the joint family system (JFS), and 43.5% were living in a nuclear family system (NFS). 85% of participants said that a family system had a significant impact on health care. 91.5% respondents were satisfied with their family system and respondents pointed towards a shift in trend i.e. family systems in Pakistan were changing from JFS to NFS (Itrat, 2007). Since social support is an important determinant of morbidity and

mortality in patients with CHD (Uchino, 2009), the changing family systems are likely to have implications in our society. Previous research from Western societies (Hemmingway & Marmot, 1999; Glynn et al 1999) have shown that individuals who are single and lack social support are more likely to die within five years post CHD than those who are married and have social support. Luttik et al. (2006) in a follow-up study of 179 patients with heart failure on their hospital readmission explored the relationship between marital status and quality of life and life endurance within 9-months of heart attack. The results of study indicated that individuals living alone were more at risk of having poor quality of life.

Other than socio-demographic variables discussed above, patient life style and eating habits have an important role to play in determining the risk of cardiac diseases. More comforting lifestyles, less time available for physical activity and intake of foods which are high in fat are some of the well-known risk factors for cardiac disease, particularly in middle and elder age groups (Blair & Jackson, 2001). An empirical study conducted by Arthur et al. (2002) showed that although exercise was instrumental in promoting recovery of patients following a Coronary Artery bypass grafting (CABG) within first 6 months after treatment, home based interventions fared far better than hospital based interventions. Smith et al. (2004) demonstrated similar results at a follow up of 1 year after treatment, maintaining that home based interventions scored better as opposed to centre-based interventions. This study was also significant since it used the Physical Activity Scale for the Elderly (PASE) in an attempt to evaluate the

average routine physical activity between home based and centre-based intervention groups. The results conclusively showed that overall, patients recovering from cardiac events scored much better on habitual physical activity than their normally healthy counterparts within the same age group.

As a result health-care professionals, as well as social welfare agencies, are exploring ways to minimize the risk and enhance factors which have better healthcare outcomes for cardiac patients.

2.2 Culture and CHD

According to Spencer-Oatey *"Culture is a fuzzy set of basic assumptions and values, orientations to life, beliefs, policies, procedures and behavioural conventions that are shared by a group of people, and that influence (but do not determine) each member's behaviour and his/her interpretations of the 'meaning' of other people's behaviour."*

In the past few decades, as the world is becoming a global village, there has been increased emphasis on understanding the health disparities and associated factors that exist across populations from different cultural groups. This understanding is meant to improve service delivery and treatment related outcomes for a variety of diseases and specifically cardiac illness (Kalbag et al., 2011). South Asians (i.e., people from India, Bangladesh, Pakistan, Nepal, Sri Lanka, Bhutan and Maldives) are among the fastest growing populations in their native continents as well as emerging as large immigrant groups in other regions like Europe and America. At the same time available evidence (Dodani et al.,

2011; Enas & Senthilkumar, 2001) suggests that rates of certain illness including coronary heart disease are high among South Asians and little is known about the interrelationship of biological, psychological, social and cultural factors in these chronic diseases which consequently influences whether they are receiving adequate treatment for these diseases or not. Some important risk factors for high prevalence of cardiac disease and its poor prognosis in this population group are health illiteracy, specific cultural practices as well as socio-economic conditions of families along with little emphasis on adopting healthy diets, exercise and adequate social support (Kalbag et al., 2011) Surveys have shown that even in developed countries where better health facilities are available, South Asians have the lowest rates of attending the regular wellness clinics (Ramaraj & Chellapa, 2008). South Asians are at higher risk for developing cardiovascular disease compared to other ethnic groups; have high rates of obesity, lack of interest in physical /exercise, and unhealthy eating habits (Kalbag et al., 2011).

The values held by people in different cultures have impact on their physical and mental well being. In most of the cultures, mental disorders are often stigmatized and people often try to hide their symptoms for fear of being stigmatized. Therefore they exhibit physical symptoms of depression such as lack of energy, body aches and pains. Patients with CHD also present similar kinds of physical symptoms which further has an impact on the diagnosis and treatment of depressive symptoms in these patients (Youssef & Deane, 2006).

A study by Misra & Khurana (2009) was conducted to understand culturally-targeted appropriate preventive interventions to a South Asian community . This study gathered first hand data to understand community's perspectives of illness, normative values, beliefs and practices. The study also educated its participants about risk factors for cardiovascular disease by conveying disease prevention messages which were tailored to take into account how cultural factors and specific attitudes might act as barriers to healthy lifestyles and treatment choices for disease. Findings showed that many participants believed that "shocking events" or "stressful life events" are reasons for cardiac arrest and that they are not preventable. Other research findings (Enas & Senthilkumar, 2001) revealed that very often South-Asian people avoid reporting pain and other milder symptoms thus it results in less health care seeking behaviors which is also viewed from the prism of how society will view this behavior and how this will affect the family. The people in Asian cultures are more tolerant of low symptoms and continue to work and carry out daily activities. Therefore people who can't work or fulfill their responsibilities as head of the family are more susceptible to develop symptoms of anxiety and depression.

The male family members being the head often have high tolerance and avoid expressing and seeking health care for milder symptoms. In cases of cardiac illness, men who are usually perceived as strong and take care of family are more likely to have mental health issues in form of anxiety and internalization of depressive symptoms. The internalization of aggression and depressive

symptoms is also more common in Asian culture particularly in men. They repress their feelings and symptoms till the time it is manifested in the form of anger outbursts. They are also likely to express their emotional distress with physical symptoms like headaches, dizziness, palpitations, body aches and pain.

In a literature review on the relationship between depression, CHD and culture, Gholizadeh et al. (2014) identified that depression has aetiological and prognostic implications for the development and management of CHD. Moreover culture plays a significant role in the manifestations and symptoms of post CHD depression, treatment seeking behaviour and adherence to doctor's recommendations and treatment regimes. It was suggested that culturally appropriate screening instruments should be used for the identification and screening of post CHD depression and therapeutic interventions may be devised, keeping in view the cultural and ethnic background of the patient.

2.3 Clinical/Behavioural Variables and CHD

Clinical and behavioral variables like smoking, disease severity and comorbid illness have been identified as significant predictors of CHDs. Mendis et al. (2011) suggested that MI can be prevented by addressing risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, high blood pressure, diabetes and high level of cholesterol. A total of 9.4 million deaths each year, or 16.5% of all deaths, can be attributed to high blood pressure (Lim et al., 2012).

This includes 45% of the deaths due to coronary heart disease (Mendis et al., 2011).

Smoking has been identified as a significant risk factor for cardiovascular diseases. It is estimated to cause 10% of CVD (Mendis et al., 2011). The prevalence of smoking among adults in England is 20% and Northern Ireland is 24%, Scotland is 25% and Wales 25% (Townsend et al., 2012). Smoking cessation and avoidance of second hand smoking reduces cardiovascular risk (Mendis et al., 2011). According to a report on the benefits of smoking cessation by the USA Department of Health and Human Services (1990), a literature review of 10 cohort studies involving 20 million people revealed that incidence of Ischemic heart disease (IHD) was much higher in smokers compared to non-smokers. The mortality risk from CHD was twice as high in smokers as compared to people who never smoked. However it was also reported that smoking cessation reduces this risk of death from CHD to almost half of the earlier risk only after 1 year of smoking abstinence. A research study in Switzerland which aimed to assess the effects of smoking in the International Prospective Primary Prevention Study in Hypertension (IPPPSH) indicated that in men and women, smoking doubled cardiac and cerebrovascular event rates while nonsmoking men had fewer myocardial infarctions and sudden deaths (Buhiler et al., 1988). Another study (Fazal et al., 2010) conducted in Pakistan assessed risk factors in a younger sample (age 20-40years) of patients diagnosed with acute MI. A total sample of 137 patients with the mean age of 36 was assessed. The results revealed smoking as one of the major risk factors identified in 64.2% of the relatively younger age group of AMI patients. In a total

sample of 137 patients, 42 patients had a family history of coronary artery disease. The frequency of other risk factors was comparatively low as compared to smoking and family history of CHD with 14.6% having hypercholesterolemia, 12.4% being obese, 7.3% having hypertension and 5.1% having diabetes mellitus.

Despite the established evidence of negative association between smoking and heart disease, some researchers have shown that quality of life may not be influenced by smoking status.For example, a study in Netherlands demonstrated that there is no significant effect of smoking cessation on QOL in patients with peripheral arterial disease (PAD). Patients, who quit smoking within 3 years after vascular surgery, did not experience a change in QOL compared to patients who kept smoking. Consequently it was suggested that smoking is a modifiable risk factor in patients with PAD (Hoogwegt et al., 2010).

Disease severity has been identified as an important factor towards prognosis in patients with CHD. Denollett et al. (2000) conducted five years prospective study and found that decreased left ventricular ejection fraction (LVEF) was a risk factor for poor exercise tolerance and recurrent MI thus ultimately leading to poor prognosis and higher risk of mortality. Martens et al. (2009) identified that previous history of cardiac disease and LVEF were predictors of mortality and recurrent MI. They also reported that Type D patients were comparatively more at risk of mortality than non-type D patients. Previous research (Goyal et al., 2005) has demonstrated that comorbid diseases were significant predictors for

poor prognosis and treatment outcomes. The impact of the severity and course of depressive symptoms on quality of life (QOL) 6 months after cardiac surgery was also examined. The results indicated that depressive symptoms 2 months after surgery were significant predictor of poorer physical and psychosocial functioning at 6 months and both preoperative and postoperative increase in depressive symptoms were independent predictors of impaired QOL after adjusting for demographic and biomedical variables (Goyal et al., 2005). The relationship between health related quality of life (HRQOL) and disease severity as assessed by left ventricular ejection fraction (LVEF) (Petersen et al., 2008), demonstrated that LVEF measured during hospitalization for acute MI is an independent determinant for later HRQOL even after controlling for socio-demographic and clinical variables. Lee (2011) conducted a prospective study aimed at investigating health related quality of life in patients undergoing CABGs and findings showed that 55% of patients reported co-morbid illness which was associated with poor physical quality of life. Moreover, levels of limited physical role, social functioning and increased body pain was reported in those patients who had co-morbid illness. Vasan et al. (2005) reported that co-morbid illness is common in patients with CAD; the most common chronic conditions include hypertension, hypercholesterolemia and diabetes. Townsend et al.(2012) reported that around six in 10 adults have high cholesterol levels and 1 in 3 adults in the UK are reported to have hypertension which are strong predictors, as well as comorbid diseases, of CAD.

Recent research has also identified that some psycho-social factors which increase the vulnerability for heart diseases also influence the outcomes of rehabilitation provided to patients suffering with cardiac diseases (Pedersen, Middle & Larsen, 2001; Grande et al., 2011). Since psycho-social factors are more likely to be influenced by cultural and social values of any society, there is need to investigate them in the context of particular societies for better management of patients with cardiac diseases. Shehpard & While (2012) argued that existing research does not help us understand which components of psychological interventions are most beneficial for patients with cardiac diseases and there is need to investigate further the nature of the relationship between quality of life and psychological variables like anxiety and depression Similar was suggested by Whalley et al. (2014) after review of existing literature on quality of life and its outcomes in heart patients. The following review of research illustrates role of psychosocial factors (anxiety, depression, type D personality, social support) in prognosis and quality of life of patients with CHD. This research evidence would guide to develop more effective psychological interventions for cardiac patients.

2.4 Psychosocial Factors, Quality of life and CHD

Psychological and social factors have an important role to play in determining the quality of life, and consequently morbidity and mortality, of patients with cardiac illness. Identification of these factors can enhance treatment planning and its outcomes for MI patients. Existing literature has identified some of the important psycho-social predictors for quality of life in MI patients. Depression

and anxiety, social support and Type D personality affect the quality of life following MI, thus affecting the overall quality of life (QOL) of these patients. Research has also been undertaken into the relationship between coping styles, quality of life, and depressive symptoms in older cardiac failure patients. The findings revealed that disease severity and maladaptive coping styles had a significant negative impact on quality of life and depressive symptoms in these patients (Klein et al., 2007). Findings also suggested that depression was a significant predictor of poor quality of life in older MI patients. However, anxiety does not predict impairment in QOL of these patients (Conn et al., 1991). Thus psychosocial characteristics, such as age and depressive symptoms, are important predictors of QOL after acute MI (Beck et al., 2001).

Dickens et al. (2006) identified the positive effects of diagnosis and treatment of post MI depression and anxiety on the health-related quality of life of MI patients. Volz et al.(2011) conducted a study to investigate the impact of a range of psychosocial variables on outcomes for chronic heart failure patients. Using a prospective cohort design, they explored the extent to which depression; anxiety, vital exhaustion, Type D personality and social support affected mortality, cardiac related readmission and health-related quality of life. Contrary to previous research, none of the psychological variables were associated with mortality. However several other links between psychological variables and outcome were found. The authors concluded that psychological variables have a strong impact on health-related quality of life; as such they recommend that such variables should be routinely assessed in chronic heart failure patients.

The authors (Volz et al., 2011) grounded their exploratory analysis in a breadth of previous research that had identified relationships between several psychological factors, quality of life and prognosis in patients with chronic heart failure. Recognizing fundamental limitations of the research in particular, that the majority of studies focused on only one or two psychological variables despite the potential for co-variation, they attempted to analyze the relative importance of each psychological variable in relation to morbidity, readmission and health-related quality of life. The sample size was modest raising potential issues of statistical power. Further the sampling method presents some limitations. For example, in a prospective cohort design there is less control over potential confounding variables. In this instance, the sample consisted of patients that had been enrolled onto an exercise rehabilitation program. The basis for selection onto the program is not stated and may have affected the type of patients sampled. This could affect the observed relationship between psychological variables and outcomes. The measures utilized by the authors to assess psychological variables were widely used measures with proven reliability and consistency. In addition, the measures had been previously validated within the sample population. Where possible, blind procedures were utilized, the rating cardiologist was blind to the participant's psychological distress. Contrary to the author's expectations, none of the psychological variables were related to mortality. However, overall symptomology for psychological variables within the sample was low. In addition, the overall level of social support was high in the sample. Therefore the absence of a specific control group (i.e. those with diagnoses or histories of depressive symptoms,

anxiety and Type D personality traits) is potentially a major confound of this study. A further potential confound of the present study is that patients were only followed up to the point of the first cardiac related unplanned admission. It is entirely possible that psychological variables such as depression and anxiety may have stronger links to outcome for cardiac patients as time progresses and admissions increase.

The authors (Volz et al., 2011) attributed several methodological and sampling biases may have attenuated the effect of psychological variables on mortality in cardiac patients. Psychological variables, in particular anxiety and vital exhaustion, were related to health-related quality of life. The study raises important concerns for quality of life in individuals with chronic heart failure.

Quality of life which is a multi-dimensional concept and may include physical, psychological, social and environmental dimensions are among the most important determinants of positive or negative outcomes in rehabilitation of patients with cardiovascular diseases as suggested by existing literature (Shephard & While, 2012). Quality of life has different facets and related with functional and health status of cardiac patients. At present little is known about the determinants of quality of life in cardiac patients which has significant role in morbidity and mortality rates. It has been explored as health-related QOL which represents patient's perception or impact of cardiac disease on his well-being (Brown et al., 2003; Rees et al., 2004; Taylor et al., 2004; Clark et al., 2005)

Based on extensive review of literature (Shehpard & While, 2012) concluded that QOL has significant relationship with improved care of cardiac patients.

MI affects nearly every aspect of an individual's Health Related Quality of Life (HRQOL) (Alsen et al., 2010; Ekman et al., 2011; Bohmer et al., 2014; Chen et al., 2011). Perhaps this is partially because those who have survived initial attacks are still susceptible to probable cardiac events in the future (Rumsfeld et al., 2001; Mortensen et al., 2000).

This study attempts to explore psychosocial predictors associated with quality of life and MI, which is an intangible and very subjective concept in itself. The idea has been pondered about, extensively discussed and scientifically explored since the beginning of time. The ancient Greek sages considered 'happiness' to be central to a positive quality of life, while it has subsequently been equaled with such ideas as wellness, enrichment and even goodness of the body and spirit (Nussbaum & Sen, 1993; Felce & Perry, 1995). The term has generated myriad definitions over time and these definitions vary in context to the disciplines that have helped identify them. For instance, Bowling (1997) mathematically identifies quality of life as the product of a natural endowment of hypothetical variables and the effort the individual has himself expended to further his position in life. Talking as a biopsychosocialist, Walker (1993; p.383) states that quality of life is a "*concept encompassing a broad range of physical and psychological characteristics and limitations which describe an individual's ability to function and derive satisfaction from so doing*". Thus physical, social,

psychological and emotional factors are considered important dimensions to be considered for strong and positive quality of life.

An assessment of the ephemeral quality of life through the health component is a relatively old concept, having been assessed for the past many decades. It has been empirically measured through such indicators as the number of hospital re-admissions following initial discharge of a health related issue, the rate of morbidity, and even the ability to function successfully in a professional capacity (Bowling, 1995; Schalock & Alonso, 2002). The concept that HRQOL is a phenomenon that encompasses substantially more than mere morbidity and mortality evaluations have evolved gradually but consistently over time (Kaplan & Bush, 1982). Salek (1998; p. 01) asserts that it encompasses elements that allow individuals to "*have a comfortable, functional and satisfying life-style post trauma*", and this awareness among patients has also been considered (Guyatt & Cook, 1994).

Notwithstanding the extensive interest that the concept "HRQOL" has generated in the past few decades, a working definition still eludes practitioners and academics alike (Hays et al., 1993). Patrick and Erickson (1993; p.20) define HRQOL as "*the value assigned to duration of life as modified by the impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment, or policy*". There are a range of definitions listed in Salek (1998) which further add to the confusion to a universally accepted definition of the term. However theorists and researchers have agreed to accept HRQOL as a multi faceted concept that encompasses

physical, emotional, social and environmental wellbeing (Ferrans et al., 2005; Strine et al., 2008). Hence, since there is no consistent and universally accepted definition for HRQOL, the references to this term in this study relate to physical, psychological, social and environmental aspects of life of an individual.

The need to study the HRQOL following an MI is important for two primary reasons. First of all it enables the patient to have a knowledge of what is likely to happen and the steps that can be taken to manage the post MI effects on quality of life of an individual (Anderson, 2008). and the findings allow physicians to gain an insight into the after-effects suffered by patients so as to enable them to provide a better quality of service through both innovative methodologies and technologies to cope with HRQOL issues post trauma (Schweikert et al., 2009). It is inevitable that an individual suffering from an acute health condition would be both psychologically and physically disturbed by the event, even after undergoing treatment. Patients need to consider their lifestyle choices before they can lead a normal life so as to minimize risk of recurrent cardiac episode. Patients are sometimes overwhelmed with all these required changes in lifestyles and treatment regime (Lofmark & Carlsson, 2005a). Research studies have shown that patients who have undergone MI treatment often experience a range of after effects, from physical symptoms such as pain and discomfort through to emotional symptoms, particularly anxiety and depression and environmental and social problems that prevent these patients from living a life of quality at par with healthy individuals (Chan et al., 2005; Todaro et al., 2005; Condon & McCarthy, 2006).

Myocardial Infarction can significantly lower the HRQOL of patients. Compared to healthy individual, patients who have suffered an MI tend to have lifestyle impairments within the context of pain management as well as issues with physical discomfort. However, the major impairment that various research studies, both qualitative and quantitative note, occurs through high levels of anxiety and vulnerability to depressive symptoms (Celano, 2012; Buneviciute et al., 2013; Hawkes et al., 2013). Following is the review of studies to demonstrate specific relationship of significant psycho-social factors (Type D anxiety, depression, social support) with CHD and quality of life.

2.5 Type D Personality and CHD

Type D personality, also referred to as distressed personality (Denollet et al., 2005), is characterized by predisposition to experience negative emotions and social inhibition across different times and situations. Denollet et al.(2005) identified two main dimensions of Type D personality i.e Negative affectivity (NA) and Social isolation(SI). Denollet (2012), described Type D personality construct as a hierarchal model, where negative affectivity (NA) expresses itself at three levels i.e. dysphoria, anxious apprehension and irritability. Social discomfort, reticence and lack of social poise are key elements to represent social inhibition (SI) in Type D people.

The association of Type D personality with cardiac diseases has been reported in several studies in Western socities. For instance, a study conducted in Germany (Hausteiner et al., 2010) on the prevalence of Type D personality

traits identified Type D personality disposition in about a quarter (23.4% men & 26.9% women) of the general population and as an independent risk factor for cardiovascular diseases in the community. Other research on the effect of Type D personality on fatal cardiac events in patients with ischemic heart disease (IHD) revealed that Type D is a predictor of negative cardiac events independent of other treatment variables. Therefore, screening of ischemic heart disease (IHD) patients for Type D personality characteristics would be beneficial for cardiac rehabilitation programs (Pedersen et al., 2004). MI patients with Type D personality characteristics are at increased risk of future cardiac events compared to non-Type D patients (Denollet & Brutsaert, 1998). Type D personality trait has also been identified as a risk factor for future cardiac events in coronary heart disease (CHD) patients, even after controlling for co-morbid symptoms of stress (Denollet et al., 2006). Another study (Aquarius et al., 2009) identified Type D as an independent predictor of risk for all causes of mortality in patients with peripheral arterial disease (PAD) even after controlling for traditional risk factors such as age, sex, diabetes mellitus and renal disease. Schiffer et al.(2005) have documented that those congestive heart failure (CHF) patients with Type D personality exhibit an increased tendency of noncompliance to life style changes and self-management. This behaviour may contribute towards the poor prognosis of these patients (Schiffer et al., 2005). Mommersteeg et al. (2010) reported Type D personality as an independent risk factor for post traumatic stress disorder (PTSD) in general population and Chug et al.(2007) found it remained a significant risk factor for PTSD in patients with MI even after controlling an important clinical variable i.e. disease severity.

It has been established through empirical evidence that Type D personality is a risk factor towards poor prognosis in CHD patients. However, it is important to establish if Type D personality manifests as an outcome to CHD over a period of time. Some studies have reported that Type D personality is found to be a stable construct over time (Martens et al., 2007; Pelle et al., 2008 Kupper et al., 2013). Martens et al. (2007) examined the stability of Type D personality in patients with acute myocardial infarction (MI) at three assessment points over the period of 18 months following MI. In particular, they evaluated the influence of demographic (gender and age) and clinical risk factors (comorbidity, cardiac history, multivessel disease, diabetes mellitus, Percutaneous coronary intervention (PCI) versus conservative treatment, anterior MI location, participation in cardiac rehabilitation, smoking status (self-report), body mass index (BMI), hypertension, hypercholesterolemia, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol levels, LDL/HDL ratio, & medication) and mood status on the stability of Type-D personality during the course of 18 months. The study reported prevalence of Type-D personality as 18.3% during hospitalization for MI. There was no significant association between demographic and disease-related characteristics with Type-D status. Smoking status, psychotropic medication, depressive and anxiety symptoms on the three measurement occasions, and lifetime diagnoses of depressive and anxiety disorders were identified as significant confounders for Type-D status. Therefore Type D appeared to be relatively stable in 18 months post MI and stability of Type D personality was not affected by changes in mood status. It

was suggested that a comparative investigation might be more helpful in gaining insight on the stability of Type D. The findings also support the significance of including personality in cardiovascular research and treatment interventions (Martens et al., 2007).

In a recent study Kupper et al. (2013) established the universality of Type D personality by conducting a cross-cultural analysis of data from 21 countries in a total sample of 6222 patients of Angina, MI and HF. The analysis indicated that Type D personality is a stable and universal construct across different type of cardiac diseases, cultures and time. However significant variations were identified in the prevalence of Type D personality and comparatively higher rates were identified in south and east European countries. These higher prevalence rates of Type D personality were attributed to female gender, being single and low level of education. Furthermore the analysis also highlighted consistent patterns of association of Type D personality with disease severity, anxiety and depression across different cultures. Clinical and behavioral factors such as hypertension, sedentary lifestyle and smoking were significantly associated with Type D personality. The authors (Kupper et al.,2013) suggested the assessment of Type D personality across different cultures and cardiac conditions.

2.6 Type D personality, psychological distress, quality of life & CHD

The existing research provides evidence about the relationship between Type D personality and a higher prevalence of psychological distress such as depressive symptoms in patients with cardiovascular disease. However , there is a need to understand its relationship with other important determinants of health

such as quality of life. This will facilitate promoting factors which enhance treatment outcomes in these patients. Some of the research studies have shown that Type D personality is associated with impaired quality of life and increased depressive symptoms in congestive heart failure (CHF) patients (Pedersen et al., 2005; Schiffer et al., 2005; Bilge et al., 2006; de Jonge et al., 2006). Research findings have also illustrated that Type D personality and poor health related quality of life (HRQL) are associated with increased risk of mortality in cardiac patients (Al-Ruzzeh et al., 2006; Pedersen et al., 2006; Pedersen et al., 2007). Pedersen & Denollet (2006) has revealed that Type D personality is associated with impaired quality of life, elevated levels of anxiety/depression and poor prognosis in patients with CVD independent of other biomedical risk factors such as disease severity (Pedersen & Denollet, 2006). A research study by Pedersen et al. (2009) has identified Type D personality as an independent predictor of impairment in emotional quality of life in primary care heart failure patients.

Type D has been independently associated with increased symptoms of anxiety and depression after adjusting for all other sociodemographic and clinical variables in Implantable Cardioverter Defibrillator (ICD) patients and their partners (Pedersen et al., 2004). Other research evidence has also suggested that Type D personality is associated with poor quality of life and depression in patients with peripheral artery diseases (PAD) independent of PAD related impairment (Aquarius et al., 2005; Aquarius et al., 2007). Research (Spindler et al.,2009) has shown that Type D personality is associated with increased

symptoms of anxiety and depression in Cardiac patients and is an independent determinant (Schiffer et al., 2008) of impaired health status in patients with CHF. Schiffer et al. (2010) also reported type D to be a significant independent determinant of cardiac mortality in patients with congestive heart failure (CHF).

Mols et al. (2010) argued that there is paucity of research evidence on the association between type D personality and health status, specifically in patient with myocardial infarction (MI). Therefore it is important to explore the impact of Type D personality on health status in MI patients. In a prospective cohort study five hundred and three patients were assessed at three points in time. During baseline assessment patients with AMI were assessed for Type D personality and depression along with demographics and clinical variables within the first week of hospital admission. Patients were assessed again at 2 months post MI for life time and currently diagnosed psychological disorders such as depression and anxiety disorders. After 18 months MI patients were examined for disease specific health status.

In this sample of 503 patients, 21.1% were identified with Type D personality characteristics. The results showed that Type D and depression were independent predictors of impaired disease specific health status in patients with Myocardial Infarction. Impairment in health status further contributes to impaired quality of life, cardiac mortality and morbidity. These findings also supported the research evidence that Type D personality and depression reflect two different

forms of distress in MI patients and have adverse impact on prognosis and outcomes post MI (Mols et al., 2010).

Both depression and Type D are likely to be associated in determining the health related outcomes in cardiac patients however, many studies have reported Type D as an independent predictor of poor health outcomes in cardiac patients. For instance Al-Ruzzeh et al. (2005) found that Type D alone, rather than depression was more significantly associated with poor health outcomes in patients with in 1 year of coronary bypass surgery. Similarly Lange (2004) found that depressive symptoms alone predicted Atrial fibrillation (AF) and Type D was not found to be associated with AF. This suggests that phenomenon should be explored in-depth in case of patients with other cardiac diseases. A summary article (Denollet et al., 2010) on the Type D personality as propensity to psychological distress in patients with cardiovascular diseases concluded that Type D personality was associated with a more than 3-fold increased risk of adverse (9 studies) cardiovascular related outcomes (mortality , morbidity & MI) and psychological distress (11 studies) over a longer period of time. The studies reported by Denollet et al. (2010) were conducted from 1995 to 2009. Most of these studies demonstrated that sub-dimensions of Type D personality such as negative affectivity (NA) and social inhibition (SI) are associated with impairment in health status and adverse cardiovascular outcomes. The authors (Denollet et al., 2010) also argued that Type D personality and depression are separate constructs with both being independently associated with adverse cardiac events and impaired quality of life. Type D is a personality trait, which is

a fairly stable characteristic; however depression may be transient reaction to stressful life event or may be identified as a psychological disorder which may persist for longer period of time. While Type D individuals are more vulnerable to psychological distress such as depression, Type D personality and depression have been identified as distinct yet complementary perspectives in cardiovascular outcomes research. After the analysis of studies on type D personality, Denollet et al. (2010) reported that Type D is a stable construct over a period of time. Certain biological and behavioral pathways may increase the risk of cardiac disease and poor cardiovascular prognosis. Biological factors such as high blood pressure, increased cortisol stress reactivity, cardiovascular stress reactivity and behavioral factors such as non-adherence to healthy lifestyle, non-compliance to treatment regime inability to engage in physical activity/exercise and attend regular medical checkups have etiological and prognostic implications for cardiac patients. Denollet et al. (2010) stressed the need for individualized cardiac care, keeping in view the significance of Type D personality and psychological distress in cardiovascular outcomes.

Studies have also documented that Type D cardiac patients are more prone to unhealthy life styles and poor coping strategies, which may have adverse impact on the quality of life of patients with CHD. The relationship between Type D personality and poor health outcomes in cardiac patients has been explained by the tendency to adopt unhealthy lifestyles (Denollet et al., 2006; Gilmour& Williams, 2011) as well as negative affectivity and social inhibition making them

prone to adopting poor coping strategies (Polman, et al., 2010) when faced with stressful situations. Svansdottir et al. (2012) investigated the relationship of Type-D personality with unhealthy lifestyle and impaired psychological status in cardiac patients. Besides that authors explored the association of Type-D with disease severity. A cross-sectional survey design was employed to investigate the nature of relationship. Standard objective measures were used to assess depression, anxiety, stress and Type-D Personality. The health related behaviors were assessed at four months follow-up to determine the relationship of these variables with unhealthy lifestyle of coronary angiography patients. The authors found that Type-D personality is likely to increase the risk of impaired psychological state three times in cardiac patients. Contrary to previous research the findings of this study did not indicate the association of Type-D personality with disease severity. The health related behaviors of Type D patients were poorer (less healthy diets, weight gain, smoking, non-compliance with follow-up treatment) than their counterparts. In Type-D patients negative illness perception was high which is understandable in context of their personality traits. Findings of study suggested devising some clinical interventions as per needs of cardiac patients who have Type-D personality (Svansdottir et al., 2012).

A recent study by Habibovic´et al. (2012) reported that Type D personality and increased levels of baseline anxiety in patients with an implantable cardioverter defibrillator (ICD) were the significant predictors for post-traumatic stress disorder (PTSD) which itself an important predictor of morbidity and mortality in

cardiac patients (Boscarino, 2008) .Other studies with cardiac patients have also found that Type D personality is associated with poor physical and psychological health outcomes like increased fatigue and mental distress (Denollet, Schiffer, Spek, 2010; Versteeg, Spek, Pedersen, Denollet, 2012).

Bunevicius et al.(2013) argued that the relationship between Type D personality and functional and health status have not been extensively explored as outcomes in cardiovascular research. It is therefore important to identify the significant determinants of functional status and their impact on cardiac rehabilitation. The main aim of the study was to examine the combined impact of NA and SI(Type D) as separate dimensions on symptoms of fatigue, functional status , and psychological distress in patients with CAD. In a cross-sectional study, 690 Luthanin patients with CAD enrolled in a cardiac rehabilitation program, agreed to participate in the study. Patients were assessed for Type D personality (NA &SI), left ventricular ejection fraction (LVEF), psychological distress (anxiety &depression) fatigue and functional status.

Analysis revealed that 34 % of patients were identified as having Type D personality characteristics. Type D personality was identified as an independent determinant of functional status (decrease exercise capacity) and decreased motivation for activity after controlling for disease severity and other clinical variables. This suggested that certain behaviour patterns such as lack of motivation for physical activity and exercise may contribute to poor prognosis in

Type D individuals even if they are enrolled in cardiac rehabilitation programs (Bunevicius et al., 2013).

Type D personality (NA&SI) was identified as a significant independent predictor of fatigue and psychological distress (depression, suicidal ideation, anhedonia & worthlessness) after controlling for demographics and clinical variables.NA and SI even as separate dimensions were identified as independent determinants of poor functional state and depressive symptoms. The authors (Bunevicius et al., 2013) suggested that screening for Type D patients before the rehabilitation programs would be helpful in identifying those patients who are less likely to comply with treatment regime and would be more prone to psychological distress. It would be beneficial for devising specialized rehabilitation programs keeping in view the high risk group (Type D personality & psychological distress) in patients with CAD. One of the limitations of the study was its crossectional study design limiting ability to infer causality between personality variables and disease related outcomes in CAD patients (Bunevicius et al., 2013). Another study (Simon et al., 2007) reported that cardiac patients with Type D personality are slow on walking tests which could be attributed to their tendency to have negative affectivity and social inhibition, however, this area needs more exploration.

Data from Pakistan is scarce in this area. A few cross-sectional studies (Naseer, 2007, Bashir, 2009, Gul & BhattiAli, 2009) have been conducted in Pakistan and have reported high prevalence of Type D personality traits in patients with myocardial infarction ranging from 45% to 67%. Studies have also identified

Type D personality as an independent predictor of post MI anxiety, depression (Bashir, 2009; Gul& BhattiAli, 2009) and Quality of life (Gul & BhattiAli, 2009) after controlling for demographic variables such as age and gender. However, there is a need to validate these findings through advance research and analysis.

A recent cross-sectional case control study (Saeed at al.,2011) examined relationship between Type D personality and quality of life in 80 cardiac patients compared with 70 healthy individuals aged between 45 to 60 years. Patients with MI (MI group) were recruited from outpatient cardiac centers in Rawalpindi, Pakistan. The MI group comprised of 49 males (61%) and 31 females (39%) whereas healthy group contained 38 Males (54%) and 32 females (46%). In order to assess Type D personality, DS-14 developed by Denollet (2005) was used. Moreover, WHO Quality of Life –BREF (WHOQOL-BREF) scale was used to measure quality of life as an outcome variable. There was a high rate of Type-D personality in MI patients (71%) as compared to healthy individuals (33%). Moreover the results suggested that Type-D personality had a negative impact on overall QOL in cardiac patients and its social inhibition component contributed significantly to low QOL compared with negative affectivity. The study also reported no gender or age differences. Findings of the study have important clinical implications however they are restricted since they do not include clinical or demographic variables that might have significant contribution in explaining poor quality of life.

Recent research evidence has also emphasized on the role of personality with quality of life in CHD patients. Personality traits such as Type D personality, emotional stability, extraversion, openness, agreeableness and conscientiousness can be an important contributor towards quality of life in patients with CHD. In a recent study, Buneviciute et al. (2013) examined the impact of personality traits, symptoms of anxiety and depression on health related quality of life (HRQOL) in patients with coronary artery disease (CAD). A sample of 514 patients was assessed for personality dimensions of emotional stability, extraversion, openness, agreeableness and conscientiousness. Analysis revealed that symptoms of anxiety, depression and emotional stability were independent predictors of health related quality of life in patients with CAD. The study highlighted the effect of psychosocial determinants such as personality traits, anxiety and depression on health related quality of life. It was therefore suggested that intervention strategies should consider personality traits along with anxiety and depressions for the treatment and management of CAD patients (Buneviciute et al., 2013).

Versteeg et al. (2011) reported on the basis of meta-analysis that both physical health and mental health status of cardiac patients with Type D personality are 2-5 times more likely to be impaired more than non-Type D patients. Middle et al (2014) argued that research evidence in the past reported an improvement in physical symptoms, HRQOL and survival rates in CAD patients after coronary artery bypass grafting surgery (CABG). The authors (Middle et al., 2014) also

mentioned that a growing number of studies found no improvement or deterioration in physical symptoms, HRQOL, and increased psychological distress in CAD patients even after CABG. Therefore Versteeg et al. (2011) examined the influence of Type D personality on no change or deterioration in HRQOL 6 months after CABG. The role of psychological distress (anxiety & depression) in the association between Type D and HRQOL was also studied using structural equation modeling technique.

In this prospective study, 256 patients scheduled for CABG were approached for recruitment into the study. Patients with comorbid chronic diseases aged 80 or above, unable to speak Dutch were not included in the study. Out of total sample of 256 patients, 198 completed the baseline assessment. Thirty patients dropped out at 6 months follow up and 168 patients completed the follow up assessment.

Demographics and clinical information were taken at baseline. Symptoms of anxiety, depression, Type D personality and HRQOL were assessed at baseline and 6 months after CABG.

The results indicated an overall improvement in symptoms of anxiety, depression and all the domains of HRQOL except for bodily pain and physical functioning after CABG. In the total sample 11.6 % patients were identified with Type D personality. Type D patients experienced increased symptoms of anxiety and depression and impaired HRQOL compared to non-Type D patients. Type D personality was found to be directly associated with increased distress, no

change or deterioration in mental health component but not with physical health component of HRQOL. The researchers reported that although 15.0 % of the study sample was lost at 6 months follow up, no significant difference was observed on gender, age and marital status between those patients who participated and those who dropped out at 6 months follow up. It was suggested that a longer follow up period of a year or more would provide more information on the association of Type D personality with psychological distress and HRQOL in patients after CABG.

The research highlighted the significance of Type D personality, anxiety and depression in post CABG health related quality of life. It was suggested that mental health professionals, researchers, cardiologists and cardiac surgeons should work together to improve clinical practice based on recent research based interventions Middle et al. (2014).

William et al.(2013) investigated the relationship between Type D personality and psychosocial outcomes in patients following MI. The main objective was to assess the association of two dimensions of Type D personality i.e. Negative affectivity (NA) and Social isolation (SI) with disability and quality of life in patients following MI. A non-consecutive sample of 192 participants (males=138; females=54) was recruited after one week of diagnosis of MI. The mean age was 66 (SD$\pm$ 10.8). At baseline patients provided demographic information (sex, age & socioeconomic status) and completed assessment for Type D personality. Clinical data such as comorbid diseases and levels of MI disease severity based

on left ventricular ejection functions (LVEF) were collected from patients' medical records. At 3 months follow up, 131 participants completed the instruments measuring quality of life and disability.

At baseline assessment 33.9% MI patients were identified as having Type D personality. Type D individuals reported high levels of disability and more impaired quality of life compared to non- Type D patients. When categorical approach for identifying Type D personality was used, it was found to be a significant predictor of quality of life and disability after adjusting for demographic and clinical variables at follow up (time 2). Dimensional approach (NA&SI) was also used to assess the relationship of two dimensions of Type D personality i.e. Negative affectivity (NA) and Social isolation (SI) with disability and quality of life. The findings showed that both NA and SI were positively correlated with higher levels of disability. Similarly there was a significant negative correlation of NA and SI with quality of life. In regression analysis, NA was identified as significant predictor of disability at time 2. Similarly NA and disease severity (LVEF) were identified as a significant predictors of impaired quality of life. However combined score of NA and SI did not predict disability or quality of life at time 2. Williams et al.(2013) identified the short follow up time (3 months) as one of the study limitations and it was suggested that association of Type D personality with cardiac outcomes should be examined on a long term basis. Since disability and quality of life was not assessed during baseline, therefore a causal relationship between Type D and quality of life or disability could not be established. It was suggested that future studies should analyze

Type D as an interaction between NA and SI, and not on a categorical basis, while predicting outcomes following MI. Since the study included only MI patients, it was further suggested that future studies should target other cardiac patients to examine the impact of Type D personality on specific groups and disease specific outcomes related to those groups of cardiac patients (William et al., 2013).

Although the dominant research studies in the area suggest strong predictive power of Type D personality towards mortality, these studies have been criticised as containing confirmatory bias and therefore not being completely accurate (Coyne & Voogd, 2012). On one side, the categorization of DS14 is questionable; the reporting of results evidenced on a comparatively small number of samples, and statistical incongruence makes it difficult to generalize. Contradictory to the common notion that Type D is a predictor of mortality, recent evidence suggests contradictory claims. For instance Pelle et al. (2010) found that Type D personality and symptoms of depression did not predict mortality in patients with heart failure. These findings were also supported by another study (Coyne et al., 2011) through multivariate analyses.

Coyne & Voogd (2012) after the review of studies assessing Type D personality and mortality ,suggested that the lack of association between Type D personality and mortality may be attributed to errors in previous modeling/interaction models of predictor covariates or confirmatory bias. Several of these studies fail to include reliable number of deaths against predictor i.e, Type D, to validate the

mortality effects. This suggests that Type D personality, as a psychological determinant of mortality following CVD, needs careful investigation and replication of previous small scale studies with large sample size (Coyne & Voogd, 2012).

On the basis of these inconsistent findings Denollet (2012) also suggested that more research is required to better understand the underlying mechanisms between Type D personality and adverse outcomes for patients with cardiac diseases.

Summary of the significant studies on type D personality and quality of life in CHD patients is presented in table 2.1.

Table 2-1: Summary of studies on Type D personality and quality of life in CHD patients

Sr. No	***Author***	***Year of Publication***	***Region/Country***	***Study Design`***	***Participants***	***Main Findings***
1	Middle et al	2014	Dutch	Prospective study	256	Type D was directly associated with increased distress, no change or deterioration in mental health dimension but not with physical dimension of HRQOL.
2	Bunevicius, et al	2013	Netherlands	Cross-sectional study	690 consecutive CAD patients	Type D personality was identified as significant determinant of poor functional status, fatigue and psychological distress independent of demographic and clinical variables.
3	Williams et al	2013	UK	Prospective study	192 MI patients	Type D individuals reported high level of disability and more impaired quality of life as compared to non-Type D patients
4	Kupper et al	2013		Cross-cultural study	6222 patients of Angina, MI and HF	Type D was identified as a universal construct across different cultures.
5	Svandottir et al	2012	Iceland	Descriptive study	1,452 cardiac patients	Significant prevalence of Type D personality was identified in cardiac patients in Iceland. Validity and reliability of DS-14 as an assessment tool to assess Type D personality was established in Icelandic population.
6	Saeed et al	2011	Pakistan	Cross-sectional comparative study	80 MI patients & 70 healthy controls	Type D personality characteristic was higher in MI patients as compared to control group of healthy individuals.

Sr. No	***Author***	***Year of Publication***	***Region/Country***	***Study Design`***	***Participants***	***Main Findings***
7	Denollet et al	2010		Systematic literature review	6121 cardiac patients	Type D personality characteristics along with depression affect cardiovascular outcomes. Both type of distress i.e Type D personality and depression are diverse yet complementary perspectives.
8	Mols et al	2010	Netherlands	Prospective	503 post MI patients	Type D MI patients have poor disease specific health status after adjusting for disease severity, and depression. Patients with depressive symptoms have more impaired health status as compared to patients with no depression. .
9	Martens et al.	2007	Netherlands	Prospective	475 post MI patients	Type D was identified a stable construct over a period of 18 months. The stability was not affected by symptoms of anxiety and depression.

2.6.1 Summary

The above mentioned research studies reported significant prevalence of Type D personality characteristics in cardiac as well as general population. The research findings also supported the stability of Type D personality over a period of time. The studies further supported the cross-cultural universality of Type D personality construct across different cultures.

Although Type D personality may predispose a person to all forms of distress, especially depression, Type D is more of a chronic form of vulnerability to psychological distress in patients with CHD. Type D personality and depression are two distinct yet complementary perspectives.

Studies have identified the significant role of Type D personality in cardiovascular disease outcomes such as impaired quality of life, morbidity and mortality. Type D personality has been identified as an independent determinant of impaired quality of life after controlling for demographic and clinical variables. Type D patients are more prone to psychological distress, more likely to engage in risky behaviour patterns and less likely to adhere to lifestyle changes and treatment plans.

Researchers have emphasized the need for including Type D personality along with anxiety and depression in risk stratification and routine screening of CHD patients for Type D personality characteristics. Patients with CHD may be screened with DS-14 (Denollet, 2005) which has been identified as a valid and reliable tool for the assessment of Type D personality traits across different

cultures. The need for more personalized approach to therapeutic interventions for management and rehabilitation of CHD patients with Type D personality was emphasized in the above mentioned review of literature. In the past decade, role of Type D personality with perceived health status and quality of life has been extensively studies in patients with heart failure (Al-Ruzzeh et al., 2005) with cardiac arrhythmia (Smith et al., 2007) however there is need to explore and gather specific evidence in case of patients with MI.

2.7 **Anxiety and CHD**

Research studies have also identified significant association between anxiety and CHD. For instant, Newman (2003) argued that anxiety disorder or symptoms of anxiety are most common after an acute myocardial infarction, and can persist for months subsequent to an MI. About 60 percent of patients usually show high anxiety and this persists for about 12 months in approximately 40 percent of patients. Other studies have shown elevated levels of anxiety in patients with chronic heart failure i.e. from 29% (Friedmann et al., 2006) up to 45% (Jiang et al., 2004). Szekely et al. (2007) found that 42% of patients with coronary artery disease presented with significant symptoms of anxiety. Anxiety was identified as most significant predictor of mortality and morbidity in patients at 4-years follow-up after coronary artery and valve surgery (Szekely et al., 2007). Some of the psychosocial factors which enhanced the vulnerability for anxiety disorders in MI patients included Type D personality and depressive disorder (Wikman et al., 2008).

Rozanski and Kubzansky (2005) proposed a number of pathways by which anxiety may influence cardiovascular disease.Various biological and behavioural factors are associated with anxiety and cardiovascular diseases. As for biological factor, anxiety may lead to excess activation of the hypothalamus-pituitary adrenal (HPA) axis and sympathetic nervous system. Excess HPA activation may lead to increased inflammation (Pitsavos et al., 2006). Anxiety is also linked to reduced heart rate variability among individuals with high levels of anxiety (Kubzansky, 1998). All these factors may lead to arrhythmias and sudden cardiac death (Carney et al., 2005). Anxiety may also influence CVD indirectly as anxiety is associated with poor health-related behaviors including smoking and excess alcohol consumption, which in turn increase the risk of CVD (Kubzansky, 1998).

Assessment and treatment of anxiety is important during the early stages of AMI to prevent potential complications that may be aggravated by anxiety and to provide comfort to patients (Dube, 2004). Higher levels of anxiety adversely affect physical functioning and interfere with role performance and role fulfillment. Furthermore, anxiety is a significant predictor of depression in both men and women with heart disease.

Studies of patients with pre-existing anxiety show that anxiety independently of conventional risk factors can be predictive of recurrent cardiac events (Thompson, 1999). Denollet & Brutsaert (2001) contributed a generally well

conducted study of psychological predictors of cardiac events after MI. They found that negative affectivity including anxiety along with social inhibition predicts cardiac events after AMI independently of established medical risk factors (Denollet & Brutsaert, 2001). Another study revealed that anxiety after MI was associated with increased risk of ischemic and arrhythmic complications. More complications were seen in patients with higher versus lower levels of anxiety. Patients with higher anxiety levels were 4.9 times more likely to have subsequent complications (Moser & Dracup, 1999).

Moser (2007) illustrated the role of anxiety in patients with cardiac diseases. The main aim of the review was to highlight the importance of treating anxiety in clinical practice and its impact on prognosis and disease related outcomes in cardiac patients. It was argued that a certain level of anxiety is necessary for the individuals to seek appropriate treatment at acute cardiac stage. However, if the symptoms of anxiety become severe or persist for long period of time, it may interfere with the cardiac treatment regimen and rehabilitation program. The high level of persistent anxiety may lead to non-compliance with healthy lifestyle, inability to change risky behavioral patterns, and failure to adhere to medication recommended for treatment. All these factors may have adverse effects on prognosis leading to increased in morbidity and mortality. Moser (2007) examined the levels of anxiety in different samples of cardiac patients (different cultures) at various stages of cardiac disease such as acute, chronic and critical stage. The significant predictors associated with anxiety and the impact of these predictors on cardiac related outcomes was also studied. The author (Moser,

2007) further reported gender differences in the expression and manifestation of symptoms of anxiety in cardiac patients. Patients with acute myocardial infarction (AMI) reported a high level of anxiety which is identified as an independent predictor of high level of in-hospital complications, impaired quality of life and mortality in patients with AMI. Prevalence of anxiety was higher in women compared to men after the diagnosis of AMI.

On the basis of studies reviewed by Moser (2007), it was concluded that symptoms of anxiety are common in cardiac patients (Eastern & Western cultures) and adversely affect the course, treatment and outcomes of cardiac disease. The detrimental impact of anxiety is often ignored/ neglected by clinician and health care providers. Therefore it is important that cardiac patients should be screened for the symptoms of anxiety, and appropriate interventions carried out, to enhance recovery and reduce the risk of future cardiac events. It was recommended that future studies should identify the high risk groups and underlying factors associated with anxiety and cardiac related outcomes.

Bunevicius et al.(2011) examined prevalence of anxiety in 523 CHD patients recruited from a cardiac rehabilitation program at the Behavioral Medicine Institute of the Lithuanian University of Health Sciences in Palanga, Lithuania. Authors used Hospital Anxiety and Depression scale (HADS), Spielberger State-Anxiety Inventory (SSAI) and Spielberger Trait-Anxiety Inventory (STAI) to screen for various Types of anxiety. Overall prevalence rate for anxiety disorders was 38%. The strength of the study was its adequate sample size.

The findings of the study cannot be generalized to patients above 80 years of age, co-morbid conditions and unstable cardiovascular level.

In a prospective cohort study, Nabi, et al.(2009) assessed 24,128 Finnish participants (9830 men, 14,298 women) aged 20 to 54 years, for the psychological and somatic components of anxiety in relation to coronary heart disease. It was reported that anxiety and in particular anxiety-related somatic symptoms such as palpitation, irregular heartbeat, muscle twitching, sweating and flushing even without exercise, were significantly linked with elevated risk for coronary heart disease in women. These results have clinical significance in terms of identification of a physiological pathway for the association between psychological factors such as anxiety and coronary heart disease.

Review of above-mentioned studies clearly demonstrates that anxiety plays an important role as an etiological and prognostic factor in coronary heart disease and thus has important treatment implications.

2.8 **Depression and CHD**

Rates of depression are usually reported to be much higher in patients with cardiac diseases than in the general population. Studies conducted in the past shown that significant symptoms of depression are present in patients recovering from a myocardial infarction (MI) and are associated with mortality and other CVD events (Watkins et al., 2002; Lauzon et al., 2003; Gottlieb et al. 2004).Research studies have reported that ventricular arrhythmias are responsible for most cases of sudden cardiac death in the post-myocardial

infarction period and events are increased in patients with a depressive co-morbidity (Carney et al., 2005; Gorman & Sloan, 2000). A study examined baseline depression and health-related quality of life due to acute myocardial infarction (Feuerbach et al., 2005)and revealed that depression was significantly correlated with overall quality of life and mental health. Decreased heart rate variability (HRV) increases the risk of ventricular arrhythmias and has been identified in people with depression (Stein et al., 2000) and in patients with post myocardial infarction depression thus increasing the risk of mortality in MI patients (Carney et al., 2001; Pitzalis et al., 2001).

Clinically significant depression is present in at least one in five of cardiac patients (Rutledge et al., 2006). Several studies have shown that prevalence of post MI depressive symptoms vary from 10 to 47 percent (Lauzon et al., 2003; Strik et al., 2003; Strik et al., 2004; Guck et al., 2001; Bush et al, 2001; Thornton et al., 2006). Other research studies have also shown that cardiac patients exhibit a wide range of minor to major symptoms of depression (Jiang et al., 2007; Lane et al., 2001; Lespérance, et al., 2002; Drory et al., 2001). Numerous studies have identified depression as a risk factor for MI (Wulsin & Singal, 2003; Van Melle et al., 2004; Frasure-Smith & Lespérance, 2005). A meta-analysis of cohort studies identified depression as an etiological risk factor for MI and post MI mortality/fatal coronary heart disease (CHD) (Nicholson et al., 2006). Some researchers have reported that despite the fact that the depression has etiological and prognostic implications for MI, it has yet to be established as an independent risk factor for CHD because of incomplete adjustment for other

conventional risk factors, severity of coronary disease and duration of depression (Dickens et al., 2005; Steptoe & Whitehead, 2005; Dickens et al., 2007). However Van der Kooy et al. (2007) conducted a meta-analysis to assess depression as an independent risk factor for various cardiovascular diseases (CVDs). Their Analysis of 28 longitudinal cohort and case control studies with depression at both baseline and CVD follow up, identified depression as an independent risk factor for different CVDs (Van der Kooy et al., 2007).

Goldston et al. (2008) investigated the link between depression and coronary heart disease (CHD). The study included nine systematic reviews and two meta-analyses for etiological link between CHD, and seven systematic reviews and two meta-analyses for prognostic implications and adverse outcome in patients with established CHD. The analysis revealed that depression was an independent etiological and prognostic risk factor in CHD and increased risk of subsequent morbidity and mortality from CHD associated with depression was in the order of 1.5 to 2 folds. Depression is even more strongly associated with adverse prognosis in established CHD with the increased risk of 2 to 2.5 folds. It was also suggested that depression is directly linked to CHD through biological mechanisms (e.g. heart rate variability, blood pressure, cardiac arrhythmias) and indirectly through behavioral pathways such as smoking, physical inactivity, lack of adherence to medical regimes and social isolation (Goldston et al., 2008).

Research evidence has suggested, that patients with incident post MI depression have impaired cardiovascular prognosis (Grace et al., 2005; De

Jonge et al., 2006a). A study conducted to evaluate the influence of post-coronary artery disease (CAD) depression on heart failure (HF) incidence. In a sample of 13,708 patients with coronary artery disease 1,377 patients were diagnosed with depression following CAD. The incidence of HF among those without a post-CAD depression diagnosis was 3.6 per 100 compared with 16.4 per 100 for those with a post-CAD depression diagnosis. Statistically, no significant difference was found between depressed patients with and without antidepressant medication treatment (May et al., 2009).

Studies from Pakistan have also shown similar prevalence trends. For instance a study conducted at the National Institute of Cardiovascular Diseases, Karachi, Pakistan revealed that almost half of patients recovering from a myocardial infarction have major or minor depression (Samad et al., 2002). Research findings also identified depressive symptoms in 37% of CAD patients in a tertiary care hospital in Pakistan (Bokhari et al., 2002).

The outcomes of depression in MI patients have been explained by number of behavioral pathways which appear to be involved in and increase the risk of poor treatment outcomes for MI patients. Studies have shown that noncompliance with medical treatment and lifestyle modification is greater in depressed MI patients (DiMatteo et al., 2000; Ziegelstein et al., 2000; Malach,& Imperato, 2004; Nina Rieckmann et al., 2006). Depressed patients have also been shown to be less likely to undertake physical activity (Paffenbarger et al., 1994) and are less compliant with dietary restriction (Lesperance et al., 1996). In addition, smoking rates are higher in depressed people and they also find it

more difficult to quit (Anda et al., 1990; Glassman et al., 1990). Symptoms of depression such as lack of motivation, and pessimism often interfere with the treatment regimen. Furthermore, depression can have adverse effects on attention, memory and other cognitive abilities that are needed to take medications consistently over time. Similarly the self-destructive behaviour patterns associated with depression might be one of the reasons for non-compliance of patients with medical regimens despite of the fact that they believed in their efficacy (Porter, 2003). Robin (2006) suggested that depression is a psychopathological maladaptive reaction to loss, stress and trauma, which affects the mind, body, and brain. As clinical depression affects different areas of functioning, depressive symptoms can be categorized into four major clusters of symptoms (i.e. emotional, cognitive, behavioral, motivational and somatic symptoms of depression).The expression of these symptoms in patients suffering from depression is described below:

Emotional symptoms*:* Emotional symptoms primarily include low mood and feelings of sadness which are characterized by crying spells. Patients are likely to describe themselves as feeling miserable, empty, humiliated and profoundly sad. Variations or mood swings may also be observed (Striling & Hellewell, 1999). Some depressed people also experience anger, agitation and seem to lose their feelings of love and affection for friends and family (Gara et al., 1993).

Motivational Symptoms*:* Motivational symptoms of depression are characterized by passivity or lack of activity. This passivity and lack of normal

response undermines the individual's ability to engage in important life functions and leads to impairment in social functioning. Beck (1976) described this state as “paralysis of will”. Depressed patients report lack of drive, initiative, and may have to force themselves to get up from the bed and engage in activities such as going to work, socializing with friends, having meals with family or having sex (Buchwald & Rudick-Davis, 1993). Many depressed people become indifferent to life and consider suicide as a final escape from the miseries of life. Studies have reported that about 15%-30 % of people suffering from depression or mood disorder actually commit suicide (Coryell & Winokur, 1992; Bertolote et al., 2004).

***Behavioral Symptoms*:** Depressed people often experience a lack of energy and considerable reduction in daily activities. They spend more time alone and may stay in bed for longer periods of time. Psychomotor retardation (an actual physical slowing of speech, movement and thinking) or psychomotor agitation (observable pacing and physical restlessness) are often present in severe major depressive disorder (Long, 1996). Researchers have reported that depressed people move with their eyes cast down and back bent, their speech is slow and they often avoid eye to eye contact (Buchwald & Rudick-Davis, 1993).

Cognitive Symptoms: Depressed people have negative views about themselves. They consider themselves as physically unattractive and repulsive. They hold a negative self-concept and believe that they are inferior, inadequate and undesirable. Cognitive symptoms of depressive disorder usually cause a

marked lowering of self-esteem and self-confidence with increased thoughts of pessimism, hopelessness, and helplessness. Cognitive symptoms are also characterized by lack of concentration, difficulty in decision making and memory problems. Patients have also reported deterioration in intellectual abilities (Willner et al., 2010). Cognitive symptoms also include poor concentration, forgetfulness and difficulty in remembering (Striling, Hellewell, 1999; Channon, Baker & Robertson, 1993). Another cognitive symptom of depression is a negative view about the future and patients with depression will usually have a bleak and pessimistic view about the future (Dixon et al., 1993; Metalsky et al., 1993) and believe that nothing can change their situation.

Somatic Symptoms: Somatic symptoms are in fact biological manifestations of depression. Depression is often characterized by physical symptoms such as headaches, fatigue, indigestion, generalized body aches/pains, dizziness and sensations in the chest. Physicians often misdiagnose depression as a physical ailment on the basis of these somatic symptoms (Kirmayer et al., 1993; Van Hermert et .al., 1993). Disturbance in sleep and appetite is common. Sleep changes can be manifested as excessive or reduced sleep characterized by early morning wakening. Patients might also experience loss of appetite, which results in decreased body weight. However one of the atypical symptoms of depression is excessive eating and weight gain (Buchwald & Rudick-Davis, 1993; Striling & Hellewell, 1999). Many depressed patients show an increased concern with bodily illness and hypochondriac complaints are also common (Striling & Hellewell, 1999).

Depression in patients with cardiac illnesses can be caused by any number of factors such as biological, psychological and social factors. All these factor are interrelated and play a significant role in the aetiology and prognosis of depression. The bio-psycho-social model explains this phenomenon in the general population and shows how one factor tends to influence the other factors. For example, it is possible to have a physical reaction to a social or psychological stressor, and vice versa. Studies have shown that the predisposing and precipitating factors mentioned above interact with each other in a circular way to cause depression and therefore may not be considered as independent from each other (Weitzman, 2004). These factors are elaborated as follows:

Biological factors: Biological factors such as genetic makeup, changes in neurotransmitter and hormones may contribute to depressive symptoms. Similarly, physical diseases and disorders are also related to depression and have etiological and prognostic implications. In a review article, Robin (2006) proposed that abnormal levels of neurotransmitters have been identified in depressed patients and may either be related to the antecedents or the consequences of the depression.

Various neurotransmitters and hormones have been linked to the development of depression (e.g., norepinephrine, serotonin, dopamine). Research has shown that lower levels of norepinephrine and serotonin may be associated with depression and other reactions such as aggression (Elhwuegi, 2004). The Catecholamine Theory of Mood was proposed as a major explanation for the

cause of depression in the 1960s by Joseph Schildkraut (1965). Schildkraut & Schatzberg (1965) suggested that a deficiency of the neurotransmitter nor-epinephrine at receptor sites caused depression while increased levels of nor-epinephrine caused mania. Schildkraut's theory was supported by the success rate of monoamine oxidase (MAO) inhibitor drugs which block the reuptake of monoamines and facilitate the release of neurotransmitters such as nor-epinephrine and serotonin. In early 1990's drugs have been developed that selectively block the reuptake of serotonin (SSRIs) by the pre-synaptic cell (Fuller, 1995) and by the end of the last century (Dencker, 2000) the highly selective nor-adrenaline reuptake inhibitor (NRIs) was introduced for the treatment of depression. It has been found in preliminary studies that the level of depression decreases in these patients, providing further evidence of the role of these neurotransmitters in depression (Comer,2005).Dopamine, a neurotransmitter that moderates reward, is a third monoamine that may be involved in depression.

Podea & Delia (2008) concluded that neurotransmitters such as serotonin and nor-adrenaline may act independently or interact with dopamine to contribute to the patho-physiology of depression. Altered dopamine and endorphin levels result in a decrease ability to experience pleasure which is a significant symptom of depression (Blows, 2000). Other neurotransmitter systems such as corticotrophin releasing factor (CRF) are currently an area of interest for researchers (Robbin, 2006). CRF controls the sympathetic nervous system and also has an integrative role in mediating hormonal and behavioral responses to

acute stress. Malfunctioning of this system results in stress related disorders such as depression (Nemeroff & Vale, 2005). Depression has been associated with hyperactivity of the hypothalamic-pituitary-adrenocortical (HPA) axis resulting in over stimulation of the sympathetic nervous system which in turn increases circulating catecholamines (adrenaline and noradrenaline) and serum cortisol (Banki, et al., 1992; Brown et al., 2004). Biological factors such as genetic makeup may also contribute to the increased susceptibility to depression (Zuckerman, 1999).

Twin studies investigating genetic factors associated with depression revealed that family members of depressed patients are more likely to be depressed or to develop depression compared to general population (Kendler et al., 2001). Researchers have shown that an individual may have a genetic predisposition to depression but an environmental stressor may act as a precipitating factor to trigger the symptoms of depression (Kendler et al., 2001; Wurtman, 2005).

***Psychological factors*:** Different psychosocial factors play an important role in the aetiology, progression and course of depression. Some of the psychological factors influencing depression include, negative thinking patterns/schemas, deficits in coping skills, low frustration tolerance and certain personality characteristics. Research studies have shown that individuals with Type D personality have increased vulnerability to depression (Pedersen et al., 2009; Polman et al., 2009; William et al., 2008). In a study of community dwelling white middle class women, it was reported that both neurochemistry (hormones,

serotonin, and genetics) and personality were common attributions for depression (Karasz, 2005).

***Social Factors*:** Social factors such as childhood traumatic experiences, early separation, abuse and lack of social support may also contribute as a triggering factor for depression. Studies have shown that early childhood traumatic experiences (Bowlby, 1982) abuse, neglect and deprivation may lead to depression (Seifert, 2012). Childhood adversities such as maltreatment predispose individuals to depression in adulthood (Bernet & Stein, 1999; Kooiman et al., 2004). Social relationships and social support are significantly associated with depressive symptoms either directly or through other life stressors (Blazer et al., 1992; Brown and Harris, 1978; Huurre, 2007 ;Robinson & Garber, 1995). It has been observed that the prevalence of severe form of depression is greater in patients with cardiac diseases. For instance, Khan et al. (2012) carried out a cross sectional study in which they investigated the prevalence of depression in 121 patients with chronic heart failure recruited from the cardiology department at Hayat Abad Medical Complex Peshawar. In this study, the prevalence rate was found out to be 30% (25 males and 11 females). Depressive symptoms were found to be higher in the older age group. The findings of this study are limited because of the small sample size (121) and unequal number of males and females. Moreover, the protocols used to screen depression are not described by the authors. Thus gender based results must be considered with caution along with questioning the criteria used to assess depression.

2.9 Anxiety, Depression and CHD

Depression and anxiety are both found to have significant associations with coronary artery disease. Studies have shown that anxiety often tends to be co-morbid with depression in patients following a myocardial infarction. Anxiety and depression are highly common in patients with various cardiac conditions, such as acute coronary syndrome (ACS), (Januzzi et al., 2000; Moser & Dracup , 1996) myocardial infarction (MI), (Barefoot , Schroll , 1996 ;Carney,2005) and heart failure (HF), (Lesman-Leegte et al., 2006; Rutledge et al., 2006 ;Lesman-Leegte et al., 2008).

A research study by Celano et al. (2012) explored the relationship of baseline anxiety with depression at 6 months follow-up in patients with acute cardiac illness. A sample of 137 depressed patients hospitalized with cardiac conditions (acute coronary syndrome, heart failure & arrhythmia) was enrolled in randomized control trial for intervention and management of depression. Demographics, clinical information and psychiatric history were collected from the hospital records during baseline assessment. Symptoms of anxiety, depression and health related quality of life were assessed at baseline and 6 months follow up. Findings demonstrated that higher anxiety scores at baseline were significantly associated with reduced improvement in depressive symptoms and increased possibility of persistent symptoms of depression at 6 months, regardless of presence of multiple relevant covariates. The study highlighted the role of anxiety in the management of depression in the cardiac

population. The authors suggested that intervention programs should include screening and management of anxiety along with depression in cardiac patients.

Luttik et al.(2011) evaluated 217 patients with coronary heart disease (myocardial infarction, heart failure, arrhythmias) for anxiety and depression in a cross-sectional study. Symptoms of anxiety, depression and recent history (6 months) of stressful life events were assessed along with demographic (gender, age marital status & education) and clinical variables (co-morbidities, duration and Type of CHD).

The results indicated elevated levels of anxiety in 42.0% of participants and depressive symptoms in 26.0% of patients with CHD. Demographic variables such as low level of education and female gender were associated with high levels of both anxiety and depression. Experience of recent stressful life events was also related to elevated levels of anxiety and depression. Depression was also associated with living alone. None of the clinical variables were associated with anxiety or depression except for co-morbidities, which were associated with a high level of anxiety. It was concluded that a high percentage of CHD patients reported high levels of anxiety and depression. Unfortunately, this study relied on only self-reporting measures to assess anxiety and depression and this is identified as one of the limitations. It was suggested that diagnostic interviews should also be carried alongside a self-reporting questionnaire for accurate diagnosis of depression and anxiety. The study highlighted the need for routine screening of patients with coronary heart disease for depression and anxiety. Luttik et al. (2011) identified some of the difficulties health professionals may

encounter during screening and management of CHD patients identified with symptoms of anxiety and depression. The Authors (Luttik et al.,2011) emphasized that the availability of trained professionals should be ensured so that the patients may be referred for appropriate treatment and psychological and psychiatric care after being evaluated for anxiety and depression. It was suggested that specific psychological interventions should be devised for the treatment of more vulnerable groups such as those patients with a lack of social support (living alone), low level of education and female patients . Furthermore cost-effective and specialized intervention programs should be devised for the treatment and management of CHD patients.

Janszky et al. (2010) investigated the long-term effects of depression and anxiety on subsequent coronary heart disease. A survey of 49,321 young Swedish men (age range=18 -20 years) was undertaken and participants were followed up for CHD and for acute myocardial infarction for 37 years. Anxiety as diagnosed by psychiatrists according to International classification of disease -8 (ICD-8) criteria independently predicted subsequent CHD events such as acute myocardial infarction. However no significant association was found between early onset depression and CHD events (Janszky et al., 2010). This study signified the etiological role of anxiety in the development of CHD.

Few research studies conducted in Pakistan have examined the association between anxiety, depression and quality of life in cardiac patients. Dogar et al (2008) examined the prevalence and risk factors for depression and anxiety in hospitalized cardiac patients in Pakistan. In this cross-sectional study, 100

patients admitted to the cardiac unit of a tertiary care hospital over eight weeks during the year 2005 were assessed. Medical history and demographic information were recorded. Hospital Anxiety and depression scale (HADS) was used to assess symptoms of anxiety and depression whereas WHO Quality of life brief (WHOQOL-BREF) scale was used to evaluate quality of life of cardiac patients.

The results revealed that 68.0% of the total sample was either diagnosed with a depressive disorder (47.0 %), an anxiety disorder (16.0%), or both (5.0%). It was also reported that patients with depression and mixed anxiety and depression had impaired quality of life as compared to the patients without these symptoms even after controlling for disease severity. Levels of depression and anxiety were higher among women (87.5%) compared to men (55%) and patients with a longer duration of illness (over six months) exhibited higher levels of anxiety and depression. The author concluded that the prevalence of depression and anxiety disorders are common in patients with CVD in Pakistan. Routine psychological assessment of cardiovascular patients for depression and anxiety was recommended since it can affect the morbidity and mortality of patients with CVD.

Although the authors (Dogar et al., 2008) mentioned the small sample size (100 patients) as one of the limitations of this study, but the sampling criteria and technique was not mentioned. Female gender, being a widow and a house wife were identified as a risk factor for psychological distress (anxiety / depression).

However the authors did not mention which methodological approach was used to identify these factors. The cross-sectional study design and absence of a control group were also reported as some of the limitations of the study. It was suggested that prospective studies should be conducted to assess the symptoms of anxiety and depression and their impact on quality of life over a longer period of time (Dogar et al., 2008).

Depression is a growing concern in patients with cardiac problems. In Pakistan, there are a handful of research studies investigating the prevalence rates in this population. Khan et al. (2013) explored the prevalence rates of depression in a tertiary care hospital setting. Patient health questionnaire-9 (PHQ-9) was used as a screening measure for depression. Overall prevalence rate of depression was 27.2%. Out of 360 (males=284, females=76) patients, 98 were diagnosed with depression, in which 71 were male patients while 27 were females. Significant predictors towards depression were old age, gender, employment status, low education level, rural residence, joint family system, and severity of illness. Although these findings suggest greater prevalence in males, unequal representation of gender in this study poses question towards their generalizability. Moreover, although residence was reported to predict depression significantly, the sample was not distributed equally in the two groups (i.e., Rural= 37.8% vs Urban = 62.2%). More importantly PHQ-9 includes nine dimensions as included in the Diagnostic and statistical manual –IV (DSM-IV), whereas other factors which are not part of the DSM criteria, such as loneliness, hopelessness and anxiety are not assessed which may have a

strong impact on aetiology and prognosis of depression. This study, however identifies several variables which may have etiological basis to depression and thus helpful in understanding depression in the context of Pakistan.

A cross-sectional comparative study (Hafizullah et al., 2011) aimed to examine the frequency of depression and anxiety in patients admitted with acute myocardial infarction (AMI) in Pakistan. Two hundred consecutive patients of AMI and 200 healthy controls among patient's relatives were assessed with Hospital Anxiety & Depression Scale (HADS) and Homes and Rahe (1967) Social Readjustment Scale. A very high percentage of patients both with AMI (77.5%) and control group (64.0%) scored on the “caseness” level of depression on HADS. Regarding the gender differences, more female patients were identified with significant symptoms of anxiety and depression as compared to male patient with AMI. Hafizullah et al (2011) attributed this high level of depression and anxiety in AMI patients and control group to overall law and order situation of the country, terrorism, poverty and economic instability in the country. Patients with AMI reported more stressful events and scored high on Social readjustment scale as compared to the control group. Keeping in view the correlational study design, a causal relationship between anxiety, depression and MI cannot be established and thus highlights the need for future research to generate valid evidence and explore implications (Hafizullah et al., 2011).

Beek and colleagues (2012) followed the longitudinal course of cardiac anxiety after a myocardial infarction (MI) in 398 hospitalized patients. Initially, 135 of

these patients were relocated in hospitals near to their home areas. Out of remaining 263 patients , 203 provided informed consent. Nine of these 203 had to be excluded due to incomplete responses on study questionnaires. The final sample of the study was 194 and average age of the patients included in this study was 62 years with male to female ratio of 2:1. Follow-up was carried out in one, three, six and twelve months post discharge. Anxiety based groups were classified according to their latent class growth analysis (LCGA) using Cardiac anxiety questionnaire (CAQ) and patients were screened for depression using Beck depression inventory (BDI). In this study, MI diagnosis was based on clinical history and troponin levels. As an outcome variable, quality of life was operationally defined using Euro quality of life (EuroQol) scale.

Authors concluded four distinct groups of patients with cardiac anxiety after one year follow-up:a low, intermediate and high level of cardiac anxiety and the fourth group reported a high yet decreasing level of cardiac anxiety. Although retention rate appeared to decrease with time, differences in anxiety course were substantial. These findings are consistent with existing literature to suggest that patients may experience various levels of anxiety, depression and thus quality of life. For clinical implications a large sample size needs to be included with persistent anxiety to get a clear estimate of the course of Anxiety. This study identifies the importance of coping strategies based on realistic expectations that can have significant importance in terms of intervention.

2.10 **Anxiety, Depression, CHD and Quality of Life**

Lane et al. (2000) looked at the impact of symptoms of anxiety and depression on quality of life and mortality in patients diagnosed with acute myocardial infarction (AMI). In this prospective study 288 hospitalized patients with AMI were assessed for the symptoms of anxiety (state & trait) and depression within 2-8 days of diagnosis of MI during baseline assessment. Demographic and clinical data were also gathered from patients and hospital records. Data regarding health behaviors such as smoking status, weekly alcohol consumption and frequency/duration of exercise was also collected. Follow up was conducted at 4 months and the outcome variables were quality of life and mortality. 25 patients had died by4 months follow up period.

At baseline level 30.9 % of patients were identified with mild to severe symptoms of depression. Depression and anxiety did not predict mortality however, MI disease severity, duration of stay in hospital and extend of heart failure were identified as significant determinants of mortality. Depression was identified as a strongest predictor of quality of life at 4 months. Along with depression, state anxiety, partner status and disease severity were also identified as significant predictors of impaired quality of life.

The authors argued that an insufficient duration of follow up may have failed to identify the impact of anxiety and depression on mortality (Lane et al., 2000). At

the same time, they presented the previous research evidence where studies (Jenkinson et al., 1993; Frasure-Smith et al., 1995; Mayou et al., 2000) with longer follow up time did not find any relationship between depression and mortality. The relationship of depression and disease severity was also discussed. Lane et al. (2000) argued that since depression was correlated with disease severity and statistically controlling the effect of disease severity, the impact of depression on mortality was diminished. Inability to clinically assess patients for major depression with standard diagnostic criteria was also as one of the limitations of the study. It was suggested that MI patients with high level of anxiety and depression should be evaluated and appropriate intervention techniques should be used for the treatment of patients following MI.

Research evidence has suggested that symptoms of anxiety and depression do not predict mortality however, these symptoms predict impaired quality of life in patients following MI (Mayou et al., 2000; Lane et al., 2001). These results suggest that psychosocial characteristics at baseline are the most important predictors of QOL after AMI. Studies have shown that anxiety is a significant predictor of impairment in quality of life (Sullivan et al., 2000) similarly Strik et al. (2003) found that depression and anxiety predict future cardiac events and increased health care consumption in patients with coronary artery disease after controlling for disease severity and age.

A review of negative emotions, specifically depression, anger/hostility, and anxiety in coronary heart disease revealed drastic effects of these emotions on

prognosis in patients with CVD (Sirois & Burg, 2003). Research evidence has shown that significant symptoms of anxiety and depression are present in patients hospitalized after MI and that those patients with high levels of anxiety and depression, are at a greater risk of adverse psychological and cardiac events after MI (Mayou et al., 2000; Moser et al., 2007).

A study by Bonnet et al.(2005) identified symptoms of anxiety and depression as independent predictor of unhealthy behaviors in a sample of 1612 consecutive participants referred for the evaluation of cardiovascular risk. Anxiety and depression were significantly associated with physical inactivity in both men and women and an unhealthy diet in men. A significant correlation was found between anxiety, depression and smoking habits in men whereas only depression was related to smoking in women (Bonnet et al., 2005). Another study by Fan et al. (2008) highlighted the relationship of cardiovascular disease (CVD) with depression and anxiety in USA non – institutionalized adults from 38 states. The results revealed that persons with a history of CVD were most likely to be experiencing current depression or have a life time diagnosis of a depressive or anxiety disorder as compared to those with no history of CVD. Analysis of socio-demographic correlates revealed that CVD survivors with minority back ground or low level of education were less like to receive a diagnosis of depression (Fan et al., 2008).

Studies conducted in India also demonstrated a relationship between anxiety and cardiac disease. Menon & Chandrasekaran (2012) examined the

psychological distress (anxiety, depression) experienced by the patients after having a myocardial infarction (MI).The objectives were to assess the levels and persistence of depressive and anxiety symptoms over the period of 1 year following MI. The relationship of these symptoms with other psychosocial, demographic and clinical factors was also assessed. A sample of 60 first time diagnosed patients of MI within 2 weeks of diagnosis was recruited from a tertiary care hospital in India. Demographics, clinical and psychosocial variables (anxiety, depression, stressful life events, neuroticism & Type A personality) were assessed at baseline. Anxiety and depression was again assessed at 1 year follow up. Findings revealed that at baseline assessment, 70.0%(n=42/60) scored high on depression and 68.3%(n=41/60) scored high on the anxiety scale of HADS. At 1 year follow up the rate of depression had dropped to 18.4% for depression and 13.2% for anxiety. Neuroticism was identified as significant predictor of psychological distress (anxiety & depression) at 1 year follow up. Regarding the stressful life events, only financial problems were reported as a stressful life event by 10% of MI patients. The decrease in the percentage of anxiety and depression at 1 year follow up was attributed to cultural factors such as social network and joint family system that may provide support in recovering from post MI, physical and psychological problems.

In this prospective cohort study Menon & Chandrasekaran(2012) attempted to highlight the significance of the relatively less explored area of psychological factors associated with MI in developing countries. Its findings however are limited due to restricted sample size of 60 patients at baseline out of which only

38 patients completed follow up assessment. The dropout rate of 36.7 % further limited the sample size, which was identified as one of the limitations of the study. In addition to limited sample size, certain outcome variables such as quality of life were not examined which might have potential influence in mortality or morbidity. Assessment of quality of life and mortality would have identified the role of anxiety and depression in MI related outcomes over the period of 1 year. The authors (Menon & Chandrasekaran, 2012) stressed on the need for routine screening of MI patients for psychological distress (anxiety, depression) and specialized intervention techniques for the management of these patients.

Hawkes et al., (2013) investigated physical and psychological predictors of quality of life in MI patients. 430 participants with diagnosis of MI were recruited from two referral centers in Brisbane, Australia. Health Related Quality of Life was measured by using Short Form 36(SF-36). Several other self-report indicators were used to examine predictors. For the purpose of this study, HRQOL (at six months following MI) was predicted from a set of variables including: physical and mental summary score; demographic variables (gender, age, marital status, education, income); clinical variables (CHD medical procedure, co-morbidities (diabetes, hypertension), BMI [kg/m2; normal weight (≤25 kg/m2), overweight/obese (>25 kg/m2)] and waist circumference); health (self-reported: physical activity, physical activity self-efficacy and intention, television (TV) viewing, diet (fruit, vegetables, total fat, saturated fat, sodium, dietary cholesterol), alcohol intake (standard drinks per day) and smoking

(yes/no);and psychosocial variables (Depression and anxiety).Findings indicated that patients who were old, unemployed or led a sedentary life style had impaired physical and psychological quality of life. Hawkes et al.(2013) drawing upon the findings from their research, suggested that, low HRQOL have negative impact on the recovery progression, conformity with treatments and capacity to perform daily life activities. It also increases the frequency of hospital re-admission, and risk for disease severity and death. The results of the study are strengthened by the appropriate and representative sample however use of self-report measures limits the study as it does not consider influence of recall bias and social desirability.

Through the research evidence, it can be established that both anxiety and co-morbid depression are associated with impaired quality of life and recurrent cardiac events and thus have a high prognostic significance (Frasure-Smith et al., 2005; Frasure-Smith & Lesperance , 2008; Friedmann et al., 2006; Strik et al., 2003; Szekely et al., 2007). Table 2.2 presents the summary of significant studies on anxiety , depression and QOL in CHD patients.

Table 2-2: Summary of studies on anxiety, depression and quality of life in CHD patients

Sr. No	***Author***	***Year of Publication***	***Region/Country***	***Study Design`***	***Participants***	***Main Findings***
1	Buneviciute et al.	2013	Lithuanian University of Health Sciences in Palanga	Cross Sectional	514 CAD patients	Symptoms of anxiety , depression and emotional stability were identified as independent predictors of health related quality of life in patients with CAD.
2	Hawkes et al	2013	Brisbane, Australia	Cross Sectional	430 participants with MI	Patients who were old, unemployed, led a sedentary life style had poor physical and psychological quality of life.
3	Celano et al.	2012	USA	Prospective	137 depressed patients	Higher levels of anxiety scores at baseline were significantly associated with lesser improvement in depressive symptoms and increased possibility of persistent symptoms of depression at months 6
4	Menon & Chandrasekaran	2012	India	Prospective cohort	60 MI patients	Level of anxiety and depression was decreased 1 year follow up the decrease was attributed to social network and family system .
5	Khan et al	2012	Peshawar, Pakistan	Cross sectional study	121 patients with CHF	Depressive symptoms were found to be higher in older age group
6	Beek et al	2012	Netherlands	Longitudinal course of cardiac anxiety study	194MI hospitalized patients	The association and pathways of anxiety post MI outcomes were identified.. Future studies should focus on MI patients with high level of anxiety in cardiac care.
7	Luttik et al	2011	Netherlands	Cross-sectional study	217 patients with coronary heart disease	Considerably high percentage of CHD patients had high levels of anxiety and depression.

Sr. No	Author	Year of Publication	Region/Country	Study Design`	Participants	Main Findings
8	Hafizullah et al.,	2011	Pakistan	Correlational	200 patients of AMI & 200 healthy control	Depression was more common in patients presenting with acute myocardial infarction
9	Janszky et al.,	2010	Sweden	Prospective follow-up study	49,321 Swedish men	No significant association was found between early onset depression and CHD events
10	Nabi, et al.,	2009	Finland	Cohort study	24,128	Somatic symptoms of anxiety were associated with an increased risk of CHD in women
11	Dogar et al	2008	Pakistan	Clinical Interviews	100 patients	High prevalence of major depressive disorder and generalized anxiety disorder in cardiac patients
12	Goldston et al.,	2008	n/a	Systematic reviews and meta-analyses		Depression was an independent etiological and prognostic risk factor in CHD
13	Van der Kooy et al	2007	n/a	Meta-analysis	28 longitudinal cohort	Depression was identified as an independent risk factor for different CVDs
14	Moser	2007	n/a	Review article	Studies from Australia, England, Japan, South Korea, USA	Anxiety assessment and treatment should be a part of the care of every cardiac patient in order to enhance recovery and decrease patients' risk of recurrent cardiac events.
15	Denollet & Brutsaert	2001	Belgium	Non-randomized clinical trial	150 men with CHD	Negative affectivity including anxiety along with social inhibition predicts cardiac events after AMI independently of established medical risk factors
16	Lane et al.,	2000	Birmingham	Prospective study	288	Depression was identified as a strongest predictor of quality of life

2.10.1 Summary

The studies reviewed have identified anxiety and depression as etiological and prognostic risk factors associated with CHD. Significantly high levels of anxiety and depression were found to be independent determinants of impaired quality of life.

2.11 **Social Support and Health**

Social support acts as a shield to withstand the harmful effects of stressful life events as reported in earlier studies conducted in the general population (Hemingway & Marmot, 1999). In the past few decades researchers have shown increasing interest in exploring the impact of social support on health outcomes particularly in relation to major illnesses like cardiac diseases (Hemingway et al., 2001), cancer (Smedslund & Ringdalb, 2004) and HIV AIDS (Yadv, 2010). This is to obtain evidence about the nature of the relationship thus enabling effective interventions to be developed for these patients. Various models have been proposed outlining the mechanisms in which social support might contribute to health and disease. There has also been some debate in the research literature about how social support should be measured (O'Reilly, 1988) and what aspects of social support are most likely to promote health. Initially the importance of social support in health was identified in the context of effects of stressful life events on health (Holmes & Rahe, 1967). It was hypothesized (Cassel, 1976; Cobb, 1976) that individuals with high levels of

social support would experience less negative health outcomes in the advent of stressful situation/event as compared to those with low levels of social support(buffer effect). However, the type of social support is thought to depend upon the kind of stress experienced. In certain situations, such as death of loved one, emotional support would be important to deal with the bereavement. In contrast economic /financial support would be more beneficial in the case of losing a job or economic difficulties. However other situational and individual factors also play a vital role in identifying the Type/ component of social support needed during a specific stressful event.

Theorists (Veil & Baumann, 1992) reported that initially, when the concept of social support emerged during the mid-1970s to early 1980s, it was mainly defined in concrete terms such as social interaction/relationships and persons. However, with the passage of time, the concept has become more complex and abstract. Multifarious dimensions of social support such as anticipation, perceptions, quality of support, quantity of supportive persons, relationships and social systems have emerged in the recent years. According to Vaux (1988 p.28) many theorists and researchers have argued that social support is a complex and multifaceted construct and therefore existing theoretical definitions are too narrow and inadequate to encompass such a broad concept. The current literature therefore views social support from following dimensions:

***Structural and Functional support*:** Structural support refers to characteristics of the network of people surrounding an individual and his/her

interaction with this network (Barth et al., 2010). Measures of the number of contacts, number of close relationships versus peripheral acquaintances, frequency of interactions, marital status, group membership, and geographic proximity describe various Types of network support (Lett et al., 2009). Lett et al.(2005) identified several limitations with this construct in terms of ambiguity between quantity and quality, combining supportive and non–supportive relationships and the fact that the structure of relationships does not necessarily describe the nature of the relationships. Functional support refers to the actual support and encouragement provided by the social network (Barth et al., 2010). Researchers (Lett et al., 2005) further differentiate between the functional support that is actually received ("received functional support") from an individual's subjective appraisal of their satisfaction with support or their perception that support would be available if needed ("perceived functional support"). Early theorists (House, 1981) defined perceived social support as "the perception of functions which are to be performed for an individual by significant others, such as family members, friends and coworkers, who can provide informational, appraisal instrumental and or emotional assistance." Perceived social support refers to a person's cognitive appraisal of the availability and adequacy of their social network.

Perceived and received functional support is further categorized into emotional support instrumental, financial, informational, and appraisal support. Figure 2-1 shows

***Emotional support*: Emotional support involves the provision of caring, empathy, love and trust (House, 1981; Krause, 1986). According to Gottileb (1978) emotional support is the most important component of social support and it is one of most significant dimension through which perception of support is conveyed to others (House 1981). Moss (1973, p.237) emphasized on the subjective aspect of social support in terms of feelings of belongingness, being needed, and loved, regardless of what one can or can't do. However Cobb (1976) proposed the reciprocal nature of emotional social support in terms of sense of belonging to a network of mutual obligation.**

***Instrumental support*: House (1981) and Tilden & Weinert (1987) define instrumental support as the 'provision of tangible goods, services and aid'. The label tangible is often used to describe types of support which may be quantified for instance, financial support (Lett et al., 2005). Types of instrumental support include financial support, informational support and appraisal support.**

***Financial support*: This refers to the economic support provided by the social network (Lett et al., 2005; Barth et al., 2010).**

***Informational support*: Researchers (Krausar, 1986; House, 1981) have identified informational support as the information provided during stressful events and problem solving (Tilden & Weinert ,1987 ; Curtona & Russell , 1990).**

***Appraisal support*: Appraisal support refers to help evaluating a situation. It involves communication of information associated with self-evaluation (House, 1981 cited in Hinson Langford et al., 1997). Khan & Antonucci (1980) define appraisal support as an affirmational support that affirms the acts and statements made by others.**

Figure 2-1: Categories of Perceived and Received Social Support

Each of the above mentioned attributes in fig 2.1 include all the possible functions of social support resulting in psychological wellbeing and positive health outcomes (Langford et al., 1997).

Social support has also been expressed as a sense of social support in terms of an individual's general perception of quantity and of quality of social support. The quantity of the social support refers to diversity of social relationships and social network such as family, friends, neighbors and other support groups. Quality of the social support is associated with the functions and the perception of reciprocity of the support (Dolbier & Steinhardt, 2000). According to Dolbier & Steinhardt (2000) the concept of a sense of social support relies on the individual's general perception of available social support rather than the actual receipt of support. It has strong implications for studies that relate social support to health. Dolbier & Steinhardt (2000) argued that by examining sense of support suggests that one's view of the social environment affects how social support is perceived and interpreted, as well as what social support is expected. Sense of support is not only relevant in stressful situations but it also plays a vital role in the interpretation of other life events.

The role of social support in relationship with health and well-being has been explained through the Social Provision Model by Weiss (1974). This model of social support includes broad range of interpersonal functions, associated either with stressful life events or wellbeing/life satisfaction irrespective of stressful situation (Curtona & Russell, 1987).This model has made a significant contribution by incorporating different dimensions of social support.

Weiss's model(1974) incorporates the major elements of most of the conceptualizations of social support (Cobb, 1979; Kahn, 1979; Schaefer et al., 1981) and identified six different social functions or "provisions" that may be obtained from relationships with others (table 2- 3). A positive perception of these six provisions is needed for individuals to feel adequately supported and avoid loneliness although each of different provisions may be more crucial in certain circumstances or at different stages of the life cycle. Weiss divided these provisions conceptually into two broad categories: assistance-related and non-assistance-related. The first category includes the functions directly relevant to problem solving in the context of stress: guidance (advice or information) and reliable alliance (often provided by family members).

The non-assistance related provisions do not contribute directly to problem solving and would seem to have beneficial effects under conditions of both high and low stress. Their effects are probably mediated by cognitive processes (e.g. enhancement of self-efficacy, effects on causal attributions processes). One such provision is reassurance of worth (recognition of one's competence, skills and value by others). According to Weiss (1974) an important aspect of interpersonal relationships is feeling needed by others. Thus he includes opportunity for nurturance (the sense that others rely upon one for their well-being) with the most frequent sources of opportunity for nurturance being one's offspring and spouse. Two other provisions are attachment (emotional closeness from which one derives a sense of security) and social integration (a sense of belonging to a group that shares similar interests, concerns and

recreational activities). According to Weiss (1974), attachment is most often provided by the spouse, but may also be derived from close friendships. Such ties may provide comfort, security, pleasure and a sense of identity and have positive impact on health (Curtona & Russell, 1987).

Russell and Cutrona (1987) compared and presented the other component models of social support in comparison with Weiss's (1974) model.

Table 2-3: Comparison of Component Models of Social Support (Russell & Curtona, 1987)

Weiss (1974)	**Cobb (1979)**	**Kahn (1979)**	**Schaefer et al. (1981)**	**Cohen et al. (1985)**
Attachment	Emotional Support	Affect	Emotional Support	
Social Integration	Network Support			Belonging Support
Reassurance of Worth	Esteem Support	Affirmation		Self-esteem Support
Reliable Alliance	Material Support	Aid	Tangible Aid	Tangible Support
Guidance	Instrumental Support	Material Support	Informational Support	Appraisal Support
Opportunity Nurturance for	Active Support			

Cobb (1979) defines active support as reflecting the receipt of care or "mothering" by the target person whereas Weiss (1974) views opportunity for nurturance as reflecting the target person providing care to others.

Curtona and Russell (1987) argued that overlap between the above mentioned models demonstrated that Weiss's model of the social provisions encompasses almost all the dimensions of social support proposed by other models. According to Weiss (1974), cited in Duru & Balkis (2007), individuals may need all the above mentioned provisions in order to feel being cared for and supported by others. However the utilization of these provisions depends upon the specific situations and factors such as personality characteristics, coping behaviors and life events.

Cohen and Wills (1985) illuminates the positive effect of social support on health by proposing two models; the stress buffering model and main effect model. The stress buffering model suggests that social support acts as a buffer against the deleterious effect of stressful life events on health. Similarly individuals with social isolation or low social support are more prone to experience negative health effects in stressful situations. In contrast, the main effect model proposes that social support and social network play a vital role in maintaining the stability and wellbeing regardless of the fact that an individual is under a stressful situation or not (Schwarzer & Leppin ,1991; Dolbier & Steinhardt,2000). Some researchers have suggested that the stress preventing effects of social support are more relevant to the quality of one's social relationships (Sarason et al., 1990).

There has been some debate in the research literature about how social support should be measured (O'Reilly, 1988), and what aspects of social support are likely to promote health. Initially the importance of social support in health was

identified in the context of effects of stressful life events on health (Holmes & Rahe, 1967). It was hypothesized (Cassel, 1976; Cobb, 1976) that individuals with high levels of social support (buffer effect) would experience less negative health outcomes in the advent of stressful situation/event as compared to those with low levels of social support. The Type of social support depends upon the kind of stress experienced. In certain situations such as death of loved once, emotional support would be more important to deal with the bereavement, whereas economical /financial support would be more beneficial in case of losing a job or economic difficulties. However other situational and individual factors also play a vital role in identifying the Type / component of social support needed during a specific stressful event. A strong network of friends and family can have therapeutic impact in the advent of a sudden stressful event such as heart attack or myocardial infarction. Social support plays a crucial role in the aetiology and prognosis of life threatening conditions such as coronary heart diseases.

2.12 **Social Support and CHD**

A comprehensive review article on the significance of social support in the aetiology and progression of coronary heart disease revealed that perceived functional support and structural support have been significantly associated with mortality and cardiac morbidity in patients. However further research measuring both the structural and functional aspects of social support is needed to clarify the specific domains and attributes of social support associated with prognosis and adverse CHD outcomes (Lett et,al., 2005).

Research evidence has suggested that perception of social support is more significant than the actual support available and is a better predictor of health outcomes (Wethington & Kessler ,1986; Helgeson ,1993 ; Norris & Kaniasty , 1996). Studies have also shown that high level of perceived support is associated with less psychological distress (Procidano & Hellerand, 1983; Cohen et al., 1988) and future cardiac events (Helgeson, 1993; Orth-Gomér et al., 1993).

The researchers (Sarason et al., 1986; Shaw et al., 2004) argued that perceived social support has its origin in early childhood experiences, parental warmth and support. The caring and supportive attitude of the family and positive involvement provide the basis for supportive relational perceptions/schemas (Flaherty & Richman, 1986). Therefore perceived social support is associated with lower susceptibility to acute diseases and a more positive course for diagnosed chronic diseases (Uchino, 2004).

Uchino (2009) presented the life span approach to social support and its association with physical health. According to Uchino (2009, p. 55) "*Individuals with positive early family environments (e.g., parental support, less conflict) develop "positive psychosocial profiles" (e.g., perceived support, self-esteem, control) and thus can cope more effectively, flexibly, and proactively with life stressors"*.

Received social support (Barrera, 2000; Tang, 2008) was identified as a situational factor provided in a stressful situation. Researchers (Uchino, 2004)

have reported inconsistent results related to received social support and physical health. It was also reported that efficacy of received support either positive or negative, depend on context and type of stressor (Berg & Upchurch, 2007).

According to the lifespan approach (Uchino, 2009) both perceived and received support are not redundant constructs and future research should include measures of both domains in order to elucidate the relationship between social support (perceived & received) and specific aspects (acute & chronic) of disease. As for the interaction between perceived and received social support, it was also suggested that individuals with high levels of perceived support would be more receptive therefore would benefit more from received social support (Uchino, 2009). However the other assumption would be that when support is simply provided, individuals with high level of perceived support may take it as a threat to their self–esteem and self-control. In this situation received social support would have negative impact rather than a positive one (Sarason & Sarason, 1986).

Stewart (1993) have identified negative aspects of social support such as stressful and conflicted social network, misguided support, avoidance and disagreement Sometimes support may be unrecognized or perceived negatively by the recipient.

The perception of, or the satisfaction with, support is likely to play a significant role in the outcome of the support activity (Heller et al., 1986). Research

evidence has suggested that future researchers should include comprehensive measures of received and perceived social support with various domains of social provisions and network support (Lett et al., 2009; Uchino 2009).

2.13 Social support, CHD and Quality of Life

Psychological distress such as depression and anxiety has detrimental effects on quality of life for patients with CHD as indicated by above-mentioned review of studies. It is likely that along with depression and anxiety, social support also affects the quality of life following MI. This view is supported by findings of some studies (Orth-Gomér et al., 1993; Frasure-Smith, et al., 2000) which report that along with depression, lack of social support is associated with adverse outcomes following myocardial infarction.

Burg et al.(2005) suggest that low perceived social support at baseline assessment predicted death/recurrent MI in the enhancing recovery in coronary heart disease (ENRICHD) trial's cohort, independent of treatment assignment. Orth-Gomer et al (1993) studied both, the emotional support, in terms of attachment, and structural support in terms of social integration in a cohort of 736 middle aged Swedish men. The results revealed that both the emotional support (attachment) and social integration were identified as independent determinants of future cardiac events. Lack of both structural and functional social support has been implicated in poorer prognostic outcomes in depressed cardiac patients. Factors such as living alone (Case et al., 1992), being socially

isolated (Ruberman et al., 1984), lack of available support (Gorkin et al., 1993), low perceived social support (Frasure-Smith et al.,2000), lack of a close confidant (Dickens et al., 2004; Williams et al., 1992) and low emotional support (Berkman et al., 1992) have all been found to increase morbidity and mortality.

Leifheit-Limson et al. (2010) examined role of social support in health status and depressive symptoms in a sample of patients who had experienced acute myocardial infarction. This prospective study included 2411 patients diagnosed with acute myocardial infarction (hospitalized in 19 United States' centers). This study concluded that lower social support is associated with poor health status and an increase in depressive symptoms over the first year of acute myocardial infarction recovery, particularly in women. Strength of the study was that longitudinal data was examined from baseline and 3 assessments during recovery. Although these results acknowledged the importance of social support, the study was limited in different contexts. For example, as this sample was recruited from specific sites, its findings are not generalized to all AMI patients from other regions or who speak or understand other languages. This study was successful in identifying risk-adjusted associations between low social support and poorer outcomes within the first year after hospitalization for AMI.

Leifheit–Limsonan et al.(2012) extended their study to further examine the changes in social support during the course of recovery from AMI (Leifheit – Limsonan et al, 2012). The prospective study explored the impact of change in perceived social support on outcomes over the period of 1 year in a sample of (N=1951) AMI patients. It was hypothesized that level of perceived social

support would vary during first year post AMI and an increase in level of perceived social support would lead to better health status and better HRQOL. Data was collected at baseline, 1 month, 6 months and 12 months follow up. Perceived social support was further categorize into four categories such as persistently low, persistently high, improved and worsened over 1 year period of time. It was found that tentatively 1 in 7 patients reported changes in perceived social support at 4 points in time during 1 year following AMI. Patients with improved or persistently high level of perceived social support had better outcomes (depressive symptoms, physical & mental functioning, disease specific QOL). Similarly patients with worsening level of perceived social support had impaired outcomes during 1 year post AMI. The authors suggested that further studies should examine the underlying factors associated with change in perceived social support.

According to Leifheit – Limson et al. (2012) further studies should focus on the ways to optimize the social support to be effectively utilized in intervention programs. As for the limitations of the study, only perceived social support was examined, other Types of social support such as received social support may also contribute to outcomes after AMI. Use of only self- reporting measures may not be indicative of some of the underlying attributes. Since the study was conducted in different institutions in USA, the results may not be generalized to patients speaking other languages from same areas.

Low levels of social support along with poor economic conditions are likely to bring poor quality of life. This finding was established by Heo and Colleagues

(2012) in a prospective correlational study in which they looked at social status as a predictor towards quality of life. 147 patients with an HF diagnosis were recruited from three hospitals in the United States. Most of the participants were male (70.1%), Caucasian (88.4%) and had moderate to high level of impairment in function. In order to test the assumption whether higher levels of social support and high economic status are related with high quality of life, covariates such as functional class and comorbidity, social support (operationalized through perceived support, marital status and emotional support) and economic status (operationalized as social status) were included in hierarchical regression analysis.

Kaplan-Meier and Cox regression methods were used to examine the hypothesis that high social support and economic status will be related with event free survival. Analysis suggested that better functional status and high economic status were related to better quality of life. These results corroborate with the existing evidence that supports the relationship between social support and clinical outcomes. The authors ground their exploratory analysis in a breadth of previous research that has identified relationships between social support and quality of life. The authors have articulated various definitions of social support and connected them with overall clinical outcomes as predicted through a review of studies and suggest that the majority of research that has used social support in various contexts has produced similar results. The authors conclude that social support may affect HRQOL and clinical outcomes through its impact on self-care behaviors and emotional well-being (Heo et al.,

2012). The sample size of this study was limited and confined to a limited geographic region and therefore the findings may not be generalized. In addition, the gender representation was negligible in this study and therefore the results cannot be confirmed for females. The average sample in this study was young whereas young age appeared to predict poor health related quality of life. This finding cannot predict similar behaviour for other age groups. In short, the study contributes towards understanding role of social support in quality of life of MI patients.

In a study by Welin et al. (2000), 275 first time diagnosed patients of myocardial infarction were followed for 10 years with 100 % assessment of morbidity and mortality. The results suggested that female sex, left ventricular failure, ventricular dysrhythmia, depression as well as lack of social support independently increased the risk for fatal coronary events amongst men and women who had suffered a first infarction. The basic purpose of this study was to test whether the 10-year prognosis after a myocardial infarction is related to psychological stress, lack of social support, anxiety, and/or depressive tendency. Another aim of the study was to analyze the prognostic importance of a series of psychosocial factors as well as interactions. There were (positive) associations amongst infarct patients between depression score and mental strain at work, life events, irritability, sleep problems, as well as lack of social support. Depression scores had independent effects on prognosis (Welin et al., 2000). Marital status, education, overtime work (hours per month), extra work and shift work were assessed according to standardized questionnaires. This

study used well established questionnaires with appropriate psychometric properties for evaluation of all variables. Care was taken to ensure that all important psychosocial variables were assessed during the study and the complete follow-up was done according to a published plan. One of the limitations which were observed during the study was that only a small number of women had an infraction during the period. Another drawback of the study was lack of information regarding left ventricular ejection fraction (LVEF).

Chung (2013) studied the direct, mediator, and moderator effects of two predictors of quality of life, perceived social support and depressive symptoms in 362 patients with HF. It was concluded that higher perceived social support was associated with better quality of life and severe depressive symptoms were associated with poorer quality of life in patients with HF. Depressive symptoms are a well-known predictor of poorer quality of life. The compelling finding in this study is that depressive symptoms mediated the relationship between perceived social support and quality of life in patients with HF; neither depressive symptoms, nor perceived social support, exhibited a moderator effect on quality of life. This result indicated that perceived social support affected quality of life through its relationship with depressive symptoms. These findings suggest that interventions to improve the quality of life by improvement of social support would be successful only when depressive symptoms were also effectively treated. Thus depression may serve as a mediator towards perceived social support and quality of life in patients with HF. One of the drawbacks of the study is the use of cross-sectional data and therefore causality cannot be determined.

The scale used in this study to assess Perceived social support did not evaluate either the quality or quantity of social support provided to these patients, as there are currently no instruments which can capture the multidimensional nature of social support. Another factor which was observed as limitation of this study would be that the measure of quality of life (i.e., Minnesota living with heart failure questionnaire MLHFQ) includes an item about depressed feeling. Thus, depressive symptoms might be a major contributor to the explained variance in quality of life in this study. However, Minnesota living with heart failure questionnaire (MLHFQ) is a disease specific quality of life measure and major components of this 21-item instrument are physical symptoms and physical/social function related to their HF experience. Using a generic quality of life measure would be another option, but most generic quality of life measures also contain emotional distress items. Another limitation of the study was low participation rate that may affect generalizability of study findings.

The low levels of social support not only increase the risk for poor physical outcomes in cardiac patients (Hedblad,et al.,1992) but have been found to increase vulnerability for depression and other psychological outcomes thus ultimately resulting in poor health for these patients. Andre´-Petersson et al. (2007) undertook a follow-up study for up to 7.8 years to determine the role of social support in prognosis of MI patients and its relationship with stress in the workplace. Findings showed that the most important predictor for cardiovascular disease and poor prognosis were low levels of social support in combination with a passive work situation. Andre´-Petersson et al. (2007) on the basis of

analysis of results of their study concluded that social support in the workplace has important implications in determining the cardiovascular health in women and suggested some measures should be taken to address it at work sites. Furthermore, Andre -Peterson also established that women were more likely to report low levels of social support associated with vulnerability for MI which was supported by similar observation made by Denton et al. (2004). They also found that women's health is generally more dependent on social factors. Some earlier evidence (Kamarck et al., 1990) indicates that presence of social support is negatively associated with cardiovascular reactivity which suggests that social support might influence the cognitive appraisal of stressful event as well as its behavioral consequences.

Lett,et al.(2005) and Burg et al.(2005) explored the significance of social support in the advent of a sudden stressful event such as heart attack or myocardial infarction. Social support plays a crucial role in the aetiology and prognosis of life threatening conditions such as myocardial infarction. Some researchers have worked on different Types of social support and its impact on psychological distress and HRQOL in cardiac patients.

In a systematic review Barth et al. (2010) identified different Types of social support and its association with prevalence of CHD in etiological studies and cardiac and all-cause mortality in the analysis of prognostic studies. The authors describe social support in two broad domains i.e. functional support and structural social support. Functional support is described as the support and encouragement provided by the social network. Functional support is further

divided into sub domains of emotional, financial, informational, and instrumental and appraisal support. Similarly structural social support was defined as the characteristics of social network and the interaction of an individual with his/her network (Barth et al., 2010). It was argued that social support (structural & functional) plays a vital role in the aetiology and prognosis CHD through number of factors such as physiological mechanisms, health related behaviors, psychosocial factors, and personality characteristics. 1736 papers were selected from 3 electronic data bases and screened in the initial phase. Finally 25 prognostic (with follow up ranging from 6 months to 14.5 years) and 5 etiological studies were included in the analysis. Since there were only 5 etiological studies, therefore quantitative summary of the etiological studies was done instead of meta-analysis. The analysis revealed significant impact of functional social support (perceived social support) and structural social support (living alone) on the prognosis of CHD in terms of mortality.

In adjusted analyses, after adjusting for potential confounders and mediators, functional social support in terms of perceived social support was found to be a risk factor associated with CHD. However no evidence of impact of structural social support on the development of CHD was found. Some of the limitations associated with systematic reviews were identified. A possibility of publication bias was acknowledged, since only significant findings were published. Another limitation was the heterogeneity of results which was attributed to differences in the measurement of the social support construct (functional & structural) in various studies. Keeping in view the association of functional support with

mortality in patients with CHD, It was concluded that the patients with low level of perceived social support should be screened and monitored. Intervention studies should be devised to enhance the social support of these patients along with medical treatment in order to reduce the risk of mortality (Barth et al., 2010). Heo et al. (2014) investigated the association of different kind of social support with physical symptoms, depressive symptoms and health related quality of life in patients with heart failure (HF). The direct impact of different types of social support such as emotional support, instrumental support, social networks, marital status, family relationships and relationships with caregivers on health related quality of life (HRQOL) was studied. They further examined the indirect association between social support and HRQOL through the mediating role of symptoms of depression and physical symptoms such as dyspnea, fatigue, pain in chest, insomnia, dyspnea, edema and dizziness. It was argued that research in past provided inconsistent findings related to the relationship between social support and HRQOL in patients with HF. Therefore examining the direct and indirect relationship between social support and HRQOL would further provide the research base evidence for role of social support in HRQOL and associated factors such as physical and depressive symptoms. In a cross-sectional correlational study 71 patients with HF were assessed for different kind of social support, physical symptoms, depressive symptoms and HRQOL with the help of different scales and questionnaires.

Contrary to researchers expectations only emotional support was significantly associated with physical and depressive symptoms and HRQOL. Hoe at al.

(2014) used the operational definition of emotional support which was defined by Zimet et al.(1990) as perception of an individual about emotional support from family, friends, and significant others. The results revealed that poor emotional support was associated with physical symptoms, depression and HRQOL. Marital status was also related with physical symptoms and HRQOL. However the relationship between emotional support and HRQOL was mediated by physical and depressive symptoms. Similarly relationship between marital status and HRQOL was also mediated by physical symptoms. Hoe et al. (2014) suggest that by improving emotional support, the physical and depressive symptoms of patients with HF would improve, which would subsequently lead to better quality HRQOL. Some of the limitations mentioned in the study were small sample size; therefore all the interactive associations between the variables were not measured. All the participants were Caucasian, and racial differences in social support and its relationship with HRQOL were not examined.

It was suggested that future studies should investigate ways to optimize emotional support and assess its effect on physical and depressive symptoms and HRQOL. The authors suggested that emotional support could be improved with the help of clinicians. Clinicians can educate /train the family and help them acquire the skills of empathetic listening through participation in group activities. Participants can learn skills to improve emotional support and can also share their feelings and emotions with a group. The significance of emotional support from, family, friends and significant others in the interventions programs to

reduce physical symptoms, psychological distress and improve HRQOL was highlighted.

The psychosocial predictors affecting the quality of life of patients with coronary heart disease (CHD) was further explored in correlational study conducted in a general hospital in Singapore (Mohammad et al., 2014). A sample of 106 out patients with CHD were recruited and assessed for quality of life, anxiety, depression, social support along with demographics and clinical data. The HRQOL of patients was also examined.

Mohammad et al. (2014) reported that the HRQOL of the patients in their study was relatively high compared to previous research evidence. The authors attributed it to the inclusion of only outpatients with CHD in the study sample. However the authors did not mention that high level of HRQOL may have been associated with low scores on HADS anxiety and depression scale and high mean score (M= 82.53) on Medical Outcomes Study Survey of Social Support (MOS_SSS) .

The analysis revealed that anxiety and depression were negatively associated with mental and physical domains of quality of life. There was a significant relationship between social support and mental health but social support was not significantly related to the physical health domain of HRQOL. The demographic variable, age (over 65 years) was significantly associated with better mental health. High level of education, income and marital status

(married) also had significant association with better physical health domain of HRQOL. Education and depression were identified as significant predictors of physical health, whereas age, depression and anxiety were significant determinants of mental health. However the non-significant relationship of social support with HRQOL was not discussed in the study. The sample was selected from one hospital and used only self-reported measures and these were identified as potential limitations of the study. Mohammad et al.(2014) suggested that the findings of this research would provide guidelines for health professionals in the treatment and management of patients with CHD. The study highlighted the significance of sociodemographic variables (age, education, income & marital status) and psychological variables (anxiety, depression) in HRQOL research among CHD patients in Singapore. However, since it was a correlational study and data was collected at one point in time, therefore changes in the psychosocial variables and the effect of these changes on HRQOL during course of recovery from MI over a certain period of time were not assessed.

Appropriate social support may contribute positively towards overall wellbeing. There are a number of reasons, why social support may positively affect prognosis following MI. Visits from friends and family may have therapeutic effects. Family members can be educated and trained to provide appropriate support and encouragement to patient since family members can help them even when they are not on a rehabilitation program (Hildingh et al., 2007; Newman, 2003; Kristofferzon et al., 2005).

Roohafza et al. (2012) carried out a study on 224 patients in a case control study and found that social support and coping strategies were strong predictors of acute coronary syndrome (ACS) in patients with ischemic heart disease. Both these factors remained significant after controlling other factors like age, sex, and traditional coronary artery disease risk factors and acute life event. This study signifies the importance of appropriate coping strategies in improving quality of life. The influence of social support can be exhibited through well managed self-care as an outcome for quality of life. Graven and Grant (2014) provided a critical review of 13 empirical studies indicating the nature of relationship between self-care behaviour and social support in patients with MI. The studies were selected from the year 2000 to 2012. The review indicated that social support promotes self-care in heart failure and suggested that all forms of social support (i.e.,emotional support, instrumental/tangible support, informational support, and appraisal support) interact to influence self-care management which helps in decision making processes regarding treatment as well as improving overall quality of life.

As far as Pakistan is concerned, few studies have examined relationship of social support and quality of life in cardiac patients. In a cross-sectional, correlational study, Gul & Najam (2002) examined the relationship between social support and depression in patients' post MI. Eighty consecutive MI patients were selected from the outpatient department of a general hospital in

Rawalpindi Pakistan. Social support was measured in terms of support provided by family members and others (friends, neighbours, co-workers & community groups). Perceived social support was also measured in these patients using a social support scale (Gul & Najam, 2002).

The analysis revealed that 49.0% of MI patients had significant symptoms of depression. There was also a significant negative correlation between depression and social support, and patients with high levels of depression reporting low levels of support provided by family /others and perceived social support. Female patients reported high symptoms of depression and low level of social support compared to male participants. Limitations of the study was the small sample size collected from a single hospital, therefore results cannot be generalized. The cross-sectional and correlational study design did not allow to infer causality or to identify underlying confounding factors which may be associated with a high level of depression and low level of social support in MI patients. The study highlighted the need for routine psychosocial assessment of MI patients for better prognosis and rehabilitation (Gul & Najam, 2002). In a prospective cohort study, Berkman et al. (1992) identified perceived emotional support as an independent predictor of mortality in patients 6 months following an acute myocardial infarction. However structural social support in terms of network size was not associated with mortality in these patients. Krumholz et al.(1998) suggested that the lack of emotional support for elderly patients hospitalized with heart failure was an independent determinant of fatal and nonfatal cardiovascular events in 1 year following the admission. Orth-Gomer et

al. (1993) studied both emotional support in terms of attachment and structural support in terms of social integration in a cohort of 736 middle aged Swedish men. The results revealed that both the emotional support (attachment) and social integration were independent predictors of future cardiac events. A strong and consistent inverse relationship has also been found between the magnitude of social support and both the development of coronary heart disease (CHD) in initially healthy people and adverse prognostic outcome in those with existing CHD (Kuper et al., 2002; Bunker et al., 2003).

Lack of both structural and functional social support has been implicated in a poorer prognosis in depressed cardiac patients. Factors such as living alone (Case et al., 1992), being socially isolated (Ruberman et al., 1984), lack of available support (Gorkin et al., 1993), low perceived social support (Frasure-Smith et al., 2000), lack of a close confidant (Dickens et al., 2004; Williams et al., 1992) and low emotional support (Berkman et al., 1992) have all been found to increase morbidity and mortality. Research evidence has also shown that lack of a close confidant, rather than depression, prior to MI was associated with adverse outcome after MI (Dickens, et al., 2004) and lower social support at baseline was an independent predictor of recurrent events at 9 months (Pedersen, et al., 2004).

In a systematic review, Shepherd and While (2012) studied the effects of cardiac rehabilitation interventions on the quality of life of patients with coronary heart disease. The authors identified 16 articles based on randomized controlled trails

(RCTs) carried out in nine countries. The authors identified 15 measures for quality of life based on four themes using thematic analysis. These included: physical wellbeing (fitness and symptoms), psychological wellbeing (anxiety and depression), social wellbeing (family life and relations) and functional status (return to work and past lifestyle). In terms of physical quality of life, the review findings suggested that cardiac rehabilitation can improve physical wellbeing through physical activity and can improve overall fitness. Moreover, the authors suggested that home based interventions are focus and central therefore more effective. This review was limited in terms of including little research on social quality of life and does not mention the preference between home based and centralized mode of intervention. Further limitations of this review include the use of three databases and English language papers only. No attempt was made to include the grey literature. The starting point of this literature reported contrasting results with psychological interventions and does not provide information about mortality benefits from different interventions. Further research is required to explore the relationship of quality of life outcomes and cardiac mortality, the relationship between improved physical well-being and anxiety, and research including older people.

Table 2-4: Summary of studies on social support and quality of life in CHD patients

Sr. No	Author	Year of Publication	Region/Country	Study Design`	Participants	Main Findings
1.	Graven and Grant	2014	USA	Integrative Review	11 quantitative 02 quantitative articles	HF patients with high levels of social support are more likely to engage in self-care behaviors
2.	Heo et al	2014	USA	Cross Sectional Correlational	71 patients with HF	Emotional support was associated with physical and depressive symptoms and HRQOL. Physical and depressive symptoms act as mediator towards the association between emotional support and HRQOL
3.	Muhammad et al	2014	Singapore	Correlational	106 patients with CHD	Anxiety depression, age and education were identified as significant predictors of HRPOL. There was negative association of social support with anxiety and depression.
4.	Chung Mislook et al	2013	USA	Secondary data analysis	362	Predictors for poor QOL are low levels of social support and high levels of depression. Depressive symptoms act as mediating variable.
5.	Staniute et al	2013	Lithuania	Quantitative descriptive study	560	Low levels of social support associated with poor QOL in CHD patients. Significant gender differences were indicated, for male participants, physical domain has relation with clinical characteristics and psychological with perceived stress and social support. In females, both physical and psychological

						domains were significantly associated with social support.
6.	Barutcu et al	2013	Turkey	Cross-sectional study	150	Presence of social support results in improved quality of life.
7.	Leifheit limson et al	2010	USA	Prospective	English- or Spanish-speaking patients with acute myocardial infarction	In female patients, low levels of social support was associated with depression and poor health status in first year after MI. Low levels of SS increase the vulnerability for angina, depression and poor mental functioning in whole sample.
8.	Leifheit limson et al	2012	USA	Prospective	2,202 AMI Patients	AMI patients with low social support did not strongly adhere to program aimed at management of risk factors. Depression act as a mediating variable as non-depressed patients had better response.
9.	Heo s et al	2012	USA	Quantitative descriptive study	147	Patients who perceive social support as of better quality had improved QOL. Some other variables like socio-economic status, levels of current functioning and co-morbid disorders play role in determining the strength of relationship.
10.	Roohafza et al	2012	Iran	Case-control study	224	Risk for ACS become high in absence of social support in patients with ischemic heart disease. Better coping strategies are associated with better prognosis which remained significant after controlling other factors like age, sex and acute life events.

11.	Barth et al	2010	Switzerland	Systematic review	25 studies	Poor functional support act as risk factor for cardiac disease and mortality.
12.	Lett et al	2005				Social support plays a critical role in the aetiology and prognosis of myocardial infarction.
13.	Barefoot et al	2003	USA	Pilot study	196	The baseline assessment of depression symptoms showed that low levels of depression associated with high levels of perceived social support. Besides high levels of perceived support and low social conflict decrease the vulnerability for depression.
14.	Frasure-Smith	2000	Canada	Cross-sectional	887	Very high levels of SS moderate the relationship of depression with mortality in heart patients. An improvement in depressive symptoms is noticed with high levels of social support.
15.	Welin et al	2000	Sweden	Prospective Cohort Study	275	All-cause mortality was significantly related with high level of depression lack of social support and disease severity (left ventricular failure, ventricular dysrhythmias).

2.13.1 Summary

On the basis of above review of literature it can be established that the relationship between social support and quality of life in MI patients cannot be ignored. The above cited review of research studies suggests that while diagnosis of cardiovascular disease is devastating on its own, lack of social support can have a gross effect on overall prognosis. Social support is an important mediator towards improved quality of life; therefore interventions incorporating the influence of psychosocial indicators must take into consideration family dynamics and social support network. Moreover, the literature also suggests that social support is conceived in different contexts such as emotional, financial, perceived and actual. This critical review suggests a need to look at gender perspectives along with socioeconomic status, age, marital status by incorporating validated measures of social support.

3 Theoretical Models

3.1 Introduction

Numerous biological, psychological, social and individual factors are associated with the development and progression of myocardial Infarction (Cohen et al., 1994; Steptoe & Marmot, 2002). It is a complex condition, which should be always be explored in a holistic manner keeping in view its multi-dimensionality. Mental health professionals have developed models and theories to describe the interaction between these diverse factors and their association with the development, course, and outcomes of cardiovascular diseases such as MI. This section aims to describe the theoretical framework for biological, psychological, social and individual factors associated with MI as well as elucidate the relationship between these factors with respect to quality of life in patients suffering from cardiac disease. Beginning with narration of the significant perspectives in analysis of health and illness behaviors, this chapter primarily provides a critical overview of some of the significant theoretical models i.e. Biopsychosocial model, Health belief model (HBM), Theory of planned behaviour (TPB), Transtheoretical model (TTM) and Self-regulation models (SRM). Along with this, this section provides an overview of Wilson & Cleary's (1995) quality of life model and its revision by Ferrans et al. (2005) has been discussed demonstrating the interrelationship of psychosocial factors with quality of life in the MI patient. Based on this critical overview of existing models

a guiding theoretical framework for the present study is formulated and presented.

Ogden, (2012) described four significant perspectives in the analysis of health and illness behaviour patterns. These include the biopsychosocial model of health, relationship between psychology and health, health and illness on a continuum and variability in health and illness across different domains.

3.2 **Biopsychosocial Model**

According to the biopsychosocial model, biological, psychological, and social factors interlink in the development of disease/disorder and in the promotion of health (Engel 1977). The biological component includes factors such as genetic makeup, structural defects and deformities, changes in neurotransmitter and hormones. Psychological factors include expectations related to health and emotions such as fear of treatment, negative thinking patterns/schemas, deficits in coping skills and low frustration tolerance. Behaviour patterns include smoking, alcohol /drug abuse and social facets of health include social values, norms, social class and cultural expectations (Odgen, 2012). An extensive review of the literature by (Schawrzer & Lepin, 1991) supported that social relationships and social support are significantly associated with health and illness either directly or through other life stressors (Ozbay et al., 2007).

3.3 **Health and Illness on a continuum:**

The extensive literature from all fields of medical sciences has identified that health and illness exist on a continuum and are affected by the complex interrelationship between biological, psychological, social and cultural factors (Bury, 2005; Institute of Medicine (US) committee on assessing Interactions among social, behavioral, and genetic factors in health, 2006; Diener & Chan, 2011). The well-established strong relationship between psychology and health emphasize that policy makers as well as health care providers cater for the health-care needs of patients in this broader context. This is becoming more important when a lot of shifting is taking place in the field of healthcare. For instance, the nature of disease is becoming more chronic due to timely availability of healthcare services. Moreover healthcare delivery is moving from single professional to many healthcare professionals and there are expectations/knowledge and involvement of patients and other family members. Psychological factors play a significant role in the aetiology /onset, course, progression, and outcomes of an illness or a disease. It has a significant effect on help seeking behaviors such as beliefs and perception about the illness and the doctor patient relationship. It also effects illness adaptation such as coping skills, perceived/received social support and health outcome such as quality of life (Odgen, 2012).

3.4 Relationship between psychology and health

The relationship between psychology and health has been demonstrated by the interaction of a number of direct and in-direct pathways towards health and illness which actually determine the onset, progression and treatment outcomes of any chronic illnesses. In case of cardiac illnesses, the direct pathways include the role of stress on progression of disease as well poor treatment outcomes. These psychological factors such as stressful life experiences cause the release of stress hormones that weaken the body's adaptive stress system. Thus having a deleterious effect on overall health of an individual where as a positive effect found to be associated with norepinephrine level (Brummett et al., 2009). Indirect pathways are illustrated by behavioral research and emphasize maladaptive life styles such as sedentary living, smoking, drug /alcohol abuse and other risky behaviour patterns (Ram & Travedi, 2012). According to this view, health is indirectly affected by the thinking/perception of people which influences their behaviour and subsequently has a negative impact on their health (Hirani & Newman, 2005).

3.5 Variability in Health and illness

Health and illness patterns vary across different cultures, socioeconomic classes, gender, region and ethnic groups (National Research Council (US) Panel on Race, Ethnicity & Health in later life, 2004). Similarly, there are

variations in individuals belonging to the same socioeconomic class, culture, and geographical region (National Research Council (US) Panel on Race, Ethnicity and Health in later life, 2004). Health psychology focuses on these variations at both the individual and cultural level to explain health and illness behavior. Numerous psychosocial factors such as emotions, coping strategies, perceptions, cognitions, learning, social norms, and social support play an important role in health and illness behaviour patterns (Pogosova et al., 2014). An overview of different models can help in understanding how these biological, individual, psychological, social, environmental and cultural factors operate and determine overall health and illness outcomes.

3.6 Theoretical Models

Theoretical models are maps which join together different aspects of a research study starting from their identification of a research question to literature review, methodology, data collection, interpretation, analysis and prediction. According to Walker and Avant (2005), a theoretical model is a graphic representation of a theory that acts as a heuristic tool that illustrates the association and the interrelationship between different constructs/concepts and assists in better comprehension and understanding of a phenomenon.

Theories in the field of health psychology have helped researchers and professionals to understand the complex interplay of conditions under which the biological, psychological, social and environmental variables operate.By specifying the reasons, levels of importance and relationship between these

variables, these theories help to identify and provide an understanding of a problem, interpretation of data, generalization beyond the present sample and foundation for future recommendations. For instance the perceptions of people about health or illness and the belief systems they hold strongly influence their approach to how they address issues related to health and well-being e.g. adopting preventive measures, medication intake, treatment follow-up (Everson-Rose & Lewis, 2005). The theoretical models in health psychology explain these health and illness related behaviors of people. Some of the theories have explained the relationship between perceptions of patients about their illness and the outcomes of any intervention planned for them. In order to better understand patients' beliefs about their conditions, and the approaches they use to cope with their illness, an overview of some theoretical models has been provided.

3.7 Social Cognitive Perspective

The social cognitive perspective has provided insight about the relationship of beliefs and cognitions associated with health related decisions made by people. (Bandura, 1998) The health belief model, theory of planned behaviour, theory of reasoned action, self-regulation model and common sense model etc. are all based on social cognitive perspective. There are some models which are particularly relevant when seeking to explain health related behaviors of patients with coronary heart disease e.g. the self-regulation model (Carver & Scheier, 1998); the theory of planned behaviour (Ajzen, 1985) and the common sense

model (Leventhal et al., 1997). A critical review of these models is presented below providing the theoretical underpinning for the present study.

3.8 Health Belief Model (HBM)

The US Public Health Services in 1950's offered health screenings and preventive programs to improve the quality of health of the general public. However, the low interest of people in these programs resulted in minimal outcomes. It was repeatedly observed in the early 1970s that specific attitudes and beliefs of individuals determine how a person will make sense of his/her health or illness. (Wicker, 1971; Fishbein & Ajzen, 1975) The health belief model (HBM) (Rosenstock, 1966; Becker et al., 1972; Becker et al., 1978) predicts the choices and behaviors adopted by people to meet their healthcare needs, and explain how specific attitudes and beliefs determine the responses of people to their illnesses (Janz & Becker 1984). This model is one of the most widely used frameworks and helps in explaining health related behaviors for variety of health problems e.g. HIV, cancer, tuberculosis, sexual health as well as cardiac illnesses. A meta-analysis of research findings by Janz & Becker (1984) based on studies conducted between 1974-1986 provided substantial empirical support for the efficacy of the HBM.

According to this model, a person may decide to adopt health-related actions in his daily life provided if he/she:

1. Feels that it is possible to avoid a negative health condition.

2. Understands that by taking that action, he/she will be safe from health-related negative consequences.

3. Believes that he/she is capable of taking positive health actions.

Therefore, the primary incentive in this model is to avoid negative outcomes and adopt positive actions to improve health. For example, a person might increase exercise, a positive action, to avoid a heart attack, a negative outcome.

Becker et al. (1972) used this model to explain the behaviors of patients with coronary heart disease (CHD) especially their adherence to medication, one of the important determinants of treatment outcomes in CHD. They found that certain perceptions and core beliefs of patients influenced the responses of coronary heart patients. They were more like to comply with the treatment if they believed that the threat of negative outcome was high or if they perceive that medication intake would decrease negative outcomes and would not be a burden in the context of finances or other resources.

Four main constructs; *perceived susceptibility, perceived severity, perceived benefits and perceived barriers* are central to the health belief model. These constructs correspond to people's perceived threats and benefits and thus determine their health related actions/behaviors (Rosenstock, 1966; Becker et al., 1972; Becker et al., 1978).Turner et al. (2007) reported that the health belief model does not provide sufficient explanation to predict health related behaviors

of MI patients. For instance, the compliance with treatment in the case of MI patients is not solely dependent on the patient. Other factors like social forces, environmental factors and some other individual factors (e.g. personality) might have a role to play and are not adequately explained by the health belief model (Bunde & Martin, 2006).

The HBM did not identify the specific influence of individual (behavioral intention), socio-economic (low pay, access to resources), cultural and environmental factors (discrimination on the basis of gender, race, ethnicity) and thus may not provide a comprehensive perspective on illness aetiology, outcomes and management of health problems. Researchers and practitioners have thus raised questions about its wider applicability. (Cochra & Mays, 1993).

3.9 Transtheoretical Model of Health Behaviour Change (TTM)

The Transtheoretical model of behaviour change (TTM) was developed by Prochaska and DiClemente (2005) and has been applied to change people's health related choice of behaviors. This model focuses on the decision-making abilities of the individual rather than the social and biological influences on behaviour as other approaches have tried (Prochaska & Velicer, 1997; Prochaska et al., 2008). Prochaska and DiClemente (2005) argued that people do not change their behavoiur abruptly and the change in behavoiur occurs through six different stages, such as pre-contemplation, contemplation, preparation, action, maintenance, and termination. The authors mentioned that a

person could successfully move from one stage of health related behaviour change to another with the help of appropriate intervention strategies applied at each stage. However there are certain limitations of TTM, since it does not take into account the social setup of an individual. Social factors such as socioeconomic status and social support play a very important role in health related behaviour change. Other factors such as time taken to move from one stage to another and individual differences in making logical and coherent decision may also affect the behaviour changes through different stages as proposed by TTM.

3.10 **Theory of Planned Behaviour (TPB)**

The theory of planned behavoiur (Ajzen, 1985) was developed from earlier theory of reasoned action, proposed by Ajzen and Fishbien (1980). In this model, the *'intention to perform the behavior'* has been identified as a key predictor of any behavior. The other key variables in this model are attitude of people, subjective norms and perceived behaviour control.

- Attitudes: These refer to the beliefs of people about the outcomes of behaviours.
- Subjective Norms: Beliefs about how important people in a person's life view behaviour.
- Behaviour intention: A person's attitude and subjective norms both contribute towards the intention of a person to perform certain behaviour.

- Perceived Behaviour Control: Internal and external factors that might influence a person's behavior.

The attitude toward certain behavoiur combined with subjective norms leads to behaviour intention and consequently to actual behaviors/actions (Fishbein & Ajzen, 1975; Ajzen ,1991; Werner, 2004).

The main assumption of theory of planned behaviour (Ajzen, 1985) in the context of health-related actions is that individuals are rational in terms of choosing their health-related action and understand the implications of their choices. "Principles of compatibility" and the idea of "behavioural intention" are two essential aspects of theory of planned behaviour. Principles of compatibility specify that specific attitudes correspond to the specific behaviour keeping in view the time and context (Ajzen 1988; Fishbein & Ajzen, 1975). Behaviour intention refers to an individual's motivation to engage with a particular behaviour which is predicted by high commitment. However, it ignores social factors such as environment surrounding the individual (such as norms) which may influence the individual behaviour (Ajzen 1991).Social factors are very important as they influence the choices made by individuals in their daily lives (Grandon et al., 2004; Werner, 2004). To address this gap Ajzen (1991) proposed an additional factor, 'Perceived Behavioural Control' in determining individual behavior. It refers to an individual's perception on how much they perceive control of a specific behaviour which might indirectly influence actual

behaviour. This model has important implications in terms of determining health related choices made by people in relation to positive health outcomes.

One of the major criticisms on theory of planned behaviour has been its strong emphasis on the association of intention with behavior. Sheeran et al.(1999) identified that intention is not always the most significant predictor of behavior. In many circumstances an "*intention-behaviour gap*" has been observed. Johnston et al. (2004) studied behaviors of one year post MI patients and found that for behaviors such as walk, exercise, smoking cessation, and appropriate diet, the intention does not turn out to be a significant predictor. However, perceived behavior control which refers to the belief that the individual can carry out a particular behavior was a significant predictor of the outcomes or actions adopted by patients one year post MI to avoid negative outcomes.

However the above-mentioned models do not clearly explain the complex integration of multiple factors involved with coronary heart disease. The existing literature has identified that cardiac diseases are usually an outcome of complex interactions among multiple factors as well as its treatment outcomes are determined by a variety of biological, psychological, social and individual factors. Health and illness behaviour patterns are very important predictors of positive and negative treatment outcomes in cardiac patients (e.g. smoking or alcohol abuse is a behaviour that has perceived short-term benefits, such as mood-relaxation at the same time has long-term costs).The role of social (socioeconomic status), environmental (stress) and individual psychological

factors (such as personality, anger proneness and depression) interact with the other pathways to increase vulnerability as well as poor response to treatment in case of cardiac diseases.

3.11 **Self-Regulation Models**

To address the shortcomings of above mentioned models, two other concepts are important to consider which include *cues to action* and *self-efficacy* addressing the '*individual's readiness to act*' used in context of modifying some habitual unhealthy behaviors such as alcohol abuse and smoking. These concepts are related to self-regulation (Cameron & Leventhal, 2003). In the past decade, there has been an increased emphasis on self-regulation models in the field of health psychology. According to Cameron and Leventhal (2003), "*Human beings have the capacity to regulate their thoughts, emotions, and behaviors which can be called as self-regulation process*". The self-regulation process has been narrated as a *dynamic motivational system of setting goals, developing and enacting strategies to achieve those goals, apprising progress and revising goals and strategies*' (Cameron & Leventhal, 2003). People regulate their health or illness related behaviors according to their perceptions about illness. Peoples' beliefs about their illness also align with commonly held beliefs about that illness in any society (Nayak et al., 2012).

The health and illness related behaviors of individuals have been explained with the help of self-regulation models which assume that the beliefs about health are

based on previous personal experiences with illness as well as conceptions of other people about that illness in any society (Levantahal & Cameron, 1987).

Carver & Scheier's self-regulation model (1998) and Leventhal's commonsense model (CSM) (Leventhal et al, 1980) are the most commonly reported models which explain the illness-related perceptions of cardiac patients and influence of these cognitions on treatment outcomes.

3.12 Carver and Scheier's Self-regulation

Personal goals are the main reference point in all self-regulation models and human behaviors revolve around achieving them. The organization of these personal goals is hierarchal and sub-goals lie under the umbrella of broader goals. In this model, the approach to goals is described in the context of continuing with certain behaviors to achieve the desired outcomes and avoidance of goals as refraining from certain activities to avoid certain outcomes. For instance, in the case of patients with cardiac disease, compliance with treatment regimens of walking or maintaining a healthy diet are opted for by the patient to achieve the objectives of restoring previous health status and similarly, other activities are carried out to avoid another attack of cardiac arrest.

In self-regulation models the feedback process serves the purpose of keeping individuals informed of their progress towards achieving the desired objectives (Carver and Scheier, 1999).Positive feedback can serve as a motivational system to continue with specific actions/behaviors to achieve the goals and

negative feedback has the function of an alarm system to revise the non-functional plans.

The behaviors of post MI patients can be explained with the help of self-regulation models. For post MI patients the goals can be categorized as approach and avoidance as well as organized in to higher and lower order. Adherence to medication, walking, smoking cessation and avoiding high calorie diets serve as lower-order goals to achieve the higher goal of avoiding another cardiac arrest or of restoring previous health status and to carry on with everyday activities. Also the feedback and optimism play an important role to help patients to adjust with cardiac disease and its outcomes on daily functioning. Heckhausen et al. (2001) described the role of discontinuing efforts to achieve the unattainable objectives. Continuous engagement with unrealistic goals can result in negative emotional consequences and harm the person's self-esteem. This also adversely affects the self-confidence of individuals to regulate their own thoughts, emotions, and behaviors.

3.13 **Leventhal's Common Sense Model**

Leventhal's common sense model (Leventhal,1980) views patients as active problem-solvers. They make sense of threats posed to their health due to disease. This cognitive representation of potential risks also determines their responses to illness. "Illness perceptions" have been denoted as "cognitive representations" or "emotional representations" in earlier descriptions of the commonsense model. In the common sense Model there are three main

constructs (i) ‘representation’ of the illness experience which could be either as cognitive representation or emotional representation, (ii) action planning or ‘coping’ responses which are followed by (iii) ‘appraisal,’ of illness management and emotion regulation thus effecting quality of life, adjustment and other outcomes (Levanthal et al.,2003).

A 3-stage model has been proposed to understand the emotional and behavioral responses of cardiac patients in the context of the common sense model. The most important stage is the process of interpretation followed by coping responses of patients. On the basis of evaluation of outcomes of coping strategies, patients rearrange their illness-related cognitive schemas. The behaviour of patients with cardiac illness has been explained in the context of these three stages. For instance, the chest pain and other symptoms of myocardial infarction are interpreted as threats to the patients’ physical health status, daily functioning and quality of life and as an increase in the risk of mortality due to cardiac arrest. Leventhal (1970) proposed *parallel process approach* (Fig 1) is adopted by patients and they simultaneously process information at cognitive and emotional level after experiencing health threats. If the threat is high e.g. after the major episode of a heart attack the feelings of fear, anxiety or sadness heightens.

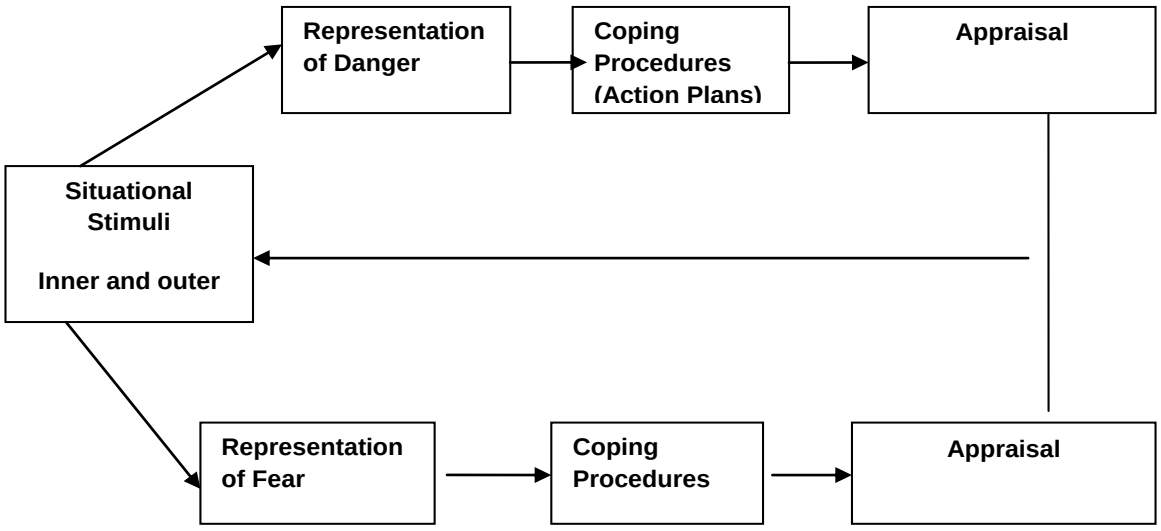


Figure 3-1: The Parallel Process Model (Rachman, 1980)

Leventhal (1970) identified five main types of illness cognitions; identity, causation, timeline, consequences and control. The individual's perception of threats associated with any illness determines their reactions towards illness as well as coping strategies adopted to face the situation. In the case of patients post MI the commonly used label of disease (heart attack) refers to the identity component of illness related cognitions. Stress, obesity and a high-calorie diet have been identified as common causes of this disease and patients respond in accordance with their perceptions of possible causes. Timeline refers to the patient's expectations about the time for development of the disease and

duration of recovery. The possible consequences of this illness include an inability to carry out daily functions, time off from work, restricted social activities and increased dependence on others for self-care. The last of Leventhal's typology of cognitions, 'control', refers to the patient's perception of having control over the disease in terms of delaying its progression or their being an early cure. This illness related cognitions have an impact on illness-related behaviors. The possible coping mechanisms adopted by patients are categorized as approach or avoidance coping techniques (Leventhal & Cameron, 1987). There might follow a stage in which cognitive representation of illness and the responses are revised in the light of judgments made by patients about the impact of coping mechanisms implemented.

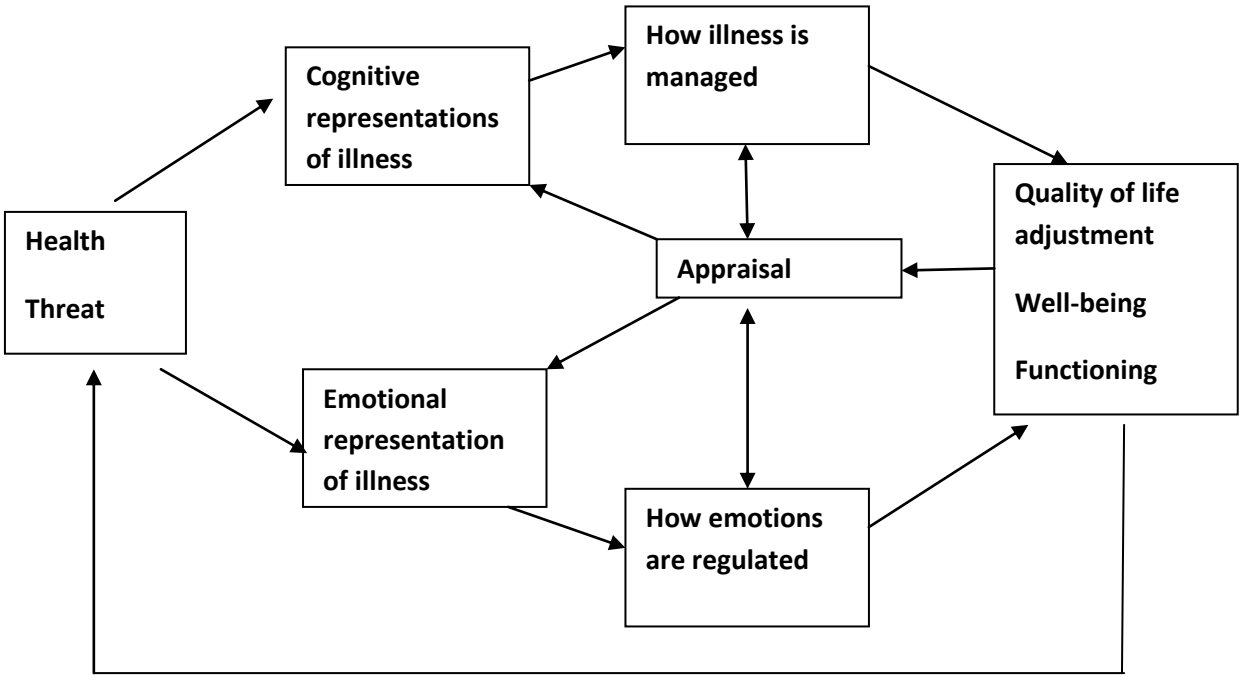


Figure 3-2: Commonsense Model (Levanthal et al., 2003)

In the common sense model there are three main constructs (i) 'representation' of the illness experience which could be either as cognitive representation or emotional representation, (ii) action planning or 'coping' responses which are followed by (iii) 'appraisal,' of illness management and emotion regulation thus effecting quality of life, adjustment and other outcomes (Levanthal et al., 2003).

The commonsense model has been applied to interpret and understand the health related behaviors of cardiac patients particularly how their responses influence their recovery from illness (Byrne, 1982; Diedricks et al., 1991; Garrity, 1973). Regardless of the severity of MI, the perceptions of patients have been found to play a significant role in determining their levels of functioning and

recovery. Patients who perceive their illness as more disabling and exhibit excessive dependency and passivity are at high risk of having another episode of cardiac arrest (Byrne, 1982; Hagger & Orbell, 2003; Lau-Walker et al., 2009).

Petrie et al. (1996) found that a strong relationship existed between patient's perception of illness and their behaviors in relation to continuing treatment, recovery and being functional. Similarly, other researchers (Cooper et al., 1999; Seeedat, 1999; Welish, 2006) found that the belief system of patients largely determined their ability to cope with their illness. Those who have a strong belief in their ability to cope with their illness were also active agents in following their treatment plan and regaining previous functional status. Based on this evidence, some interventions have been specifically designed for MI patients. These target cognition and the belief systems of patients, consequently modifying their behaviour (Petrie et al., 2002).Cardiac patients who were exposed to some brief cognitive behaviour intervention, showed better treatment outcomes as compared to patients who had negative perceptions of their illness. The intervention comprised of sharing some information related to the pathophysiology of MI, knowing about patients' beliefs about the cause to their MI and addressing any misconceptions they have related to their health conditions. Patients who received this brief therapy not only had better treatment outcomes but also responded better than controls on other variables like optimism, quality of life and regaining social and domestic responsibilities (Petrie et al., 2002). The common sense model explains and predicts the health related behaviour of cardiac patients by targeting patient's cognition, personality, and

prospective thinking (Cooper et al., 1999; Petrie et al., 2002; 1996; Steed et al., 1999; Williams, 2007).

While preventive interventions aim to change behavioral risk factors such as poor eating habits, alcohol use, smoking and sedentary lifestyle, the patients' perceptions about their condition and effectiveness of these measures determine the concordance with risk factor reduction (Lau-Walkder et al., 2009). Lin et al. (2012) investigated the role of social influence in altering the cardiac patients' perceptions about their illnesses. Their research examined the perceptions of people with other chronic illnesses about coronary heart disease, assuming that the perceptions of these people are likely to reflect societal misconceptions about cardiac illnesses. They found that patients with a non-cardiac chronic illness held similar misconceptions about cardiac diseases as patients with myocardial infarctions. These findings were explained using Leventhal's self-regulatory model, which states that social factors influence each variable involved in the representations of health threats and coping with illness (Lin et al.,2012).The study findings strongly suggested that patients' misconceptions and maladaptive beliefs should be taken into account when planning primary or secondary interventions for these patients. In addition, there is a need for education programs targeting patient, family, and overall societal beliefs about cardiac illness (Lin et al., 2012).

The common sense model of health and illness is a very useful model in terms of identifying the role of cognitive representations of illness, which ultimately

have an impact on health and rehabilitative behaviors (Leventhal et al., 2003). However, it does not include the role of personality factors which might influence the cognitive representation (Moutafi et al.,2006).A relationship between personality dimensions and cognition has been supported by previous research studies (Moutafi et al., 2006; Soubelet & Salthouse, 2011). Some research findings indicate negative relations of Neuroticism to cognitive measures (Crowe et al., 2006; Wilson et al., 2007) while other research has indicated that higher levels of openness are associated with better performance on several cognitive tasks (Ackerman & Heggestad, 1997; DeYoung et al., 2005). To address this William (2007) included personality as a mediating variable in her adaptation of the common sense model.

3.14 **William (2007) Adaptation of Commonsense Model**

William (2007) adapted Leventhal et al. (2003) commonsense model to include the role of personality. Type D personality was found to be an important personality construct associated with neuroticism and depression. She found that five possible mechanisms; health-related behavior, adherence, social support, cardiovascular reactivity, and illness perceptions associated with Type D personality may lead to adverse outcomes in cardiac patients. William (2007) argued that type D personality is associated with both emotional and cognitive processes after a life threatening event such as MI. Therefore MI patients with type D personality would be at greater risk of developing, depression and anxiety (emotional processes) following an MI. They would also have more

negative perception (cognitive process) about their disease which would subsequently have an impact on their recovery and quality of life post MI.

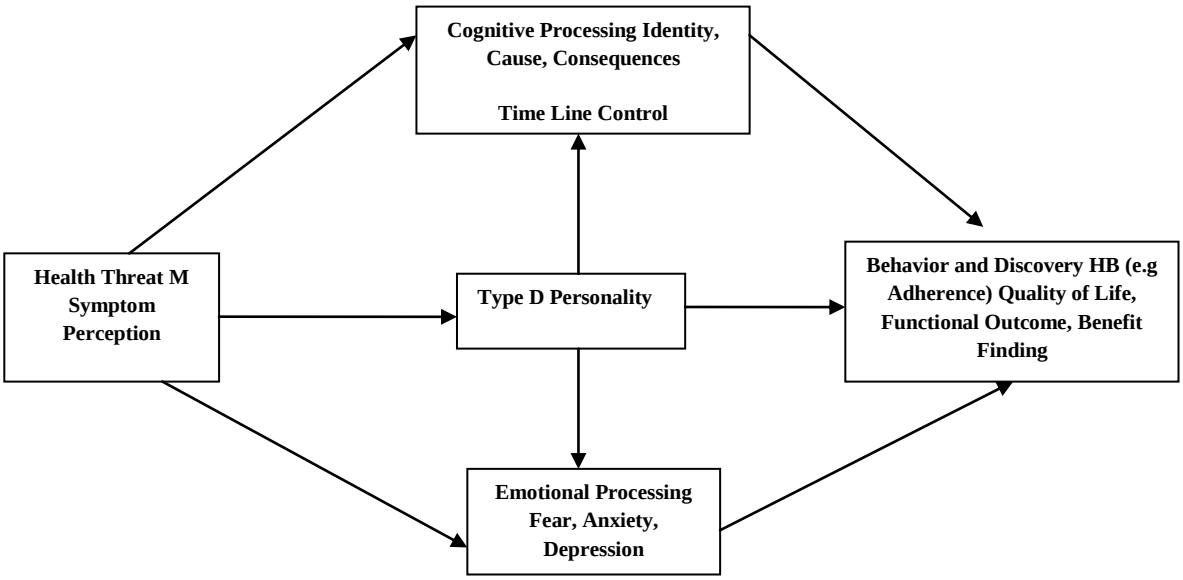


Figure 3-3: William (2007) Adaptation of Commonsense Model

This adaptation (Williams, 2007) illustrates the link between Type-D personality, cognitive and emotional processing which consequently influences quality of life of cardiac patients.

3.15 **Models of Quality of life**

The main aim of the present study was to identify the psychosocial predictors of quality of life outcomes in patients following a myocardial infarction. Researchers have identified the need for causal models of quality of life (QOL) which would clearly identify the different domains of quality of life and their association with predictors (Ferrans et al., 2005; Wilson & Cleary, 1995). According to Polite et al. (2003), theoretical models are significant mechanisms for integrating and summarizing facts from various separate research studies. The following section provides an overview of some models which illustrates relationship of various psychosocial factors with quality of life.

Some of the most significant models of quality of life, which have frequently used in health care research (Bakas et al., 2012) are presented below. In their recent systematic literature review on health related quality of life models Bakas et al. (2012) included nearly one hundred articles from research studies conducted in 21 different countries. Bakas et al (2012) critical analyzed these models and recommended the most comprehensive models for future use in health research and clinical practice. The three models included in the review were Wilson and Cleary's model (1995), Ferrans et al's (2005) revised version of the Quality of life model and the World Health Organization's , International Classification of Functioning, Disability and Health (WHO-ICF) (Zdrowia, 2007) model.

3.16 **Wilson and Cleary Model (1995)**

Wilson and Cleary (1995) developed a causal model with clear distinctions between the most common approaches used to assess health related quality of life (HRQOL). They used the terms health status and HRQOL interchangeably and proposed a conceptual model of HRQOL that moved beyond observation of health status toward assessment of causal relationships among components of HRQOL and integrated both biological and psychological aspects of health outcomes. In doing so they integrated two different conceptual paradigms proposed by social scientists and clinician/ basic science researchers.

The model has diagnostic and therapeutic implications for clinicians and health care professionals. The five levels of the Wilson & Cleary (1995) model are 1) biological-physiological variables, 2) symptom status, 3) physical functional status, 4) general health perception, and 5) overall quality of life in terms of subjective wellbeing.

These domains are further influenced by the characteristics of the individual and their environment (Peterson & Bredow, 2009). Wilson & Cleary have clearly defined all the five domains in their model. However the characteristics of individuals and the environment were not explicitly defined.

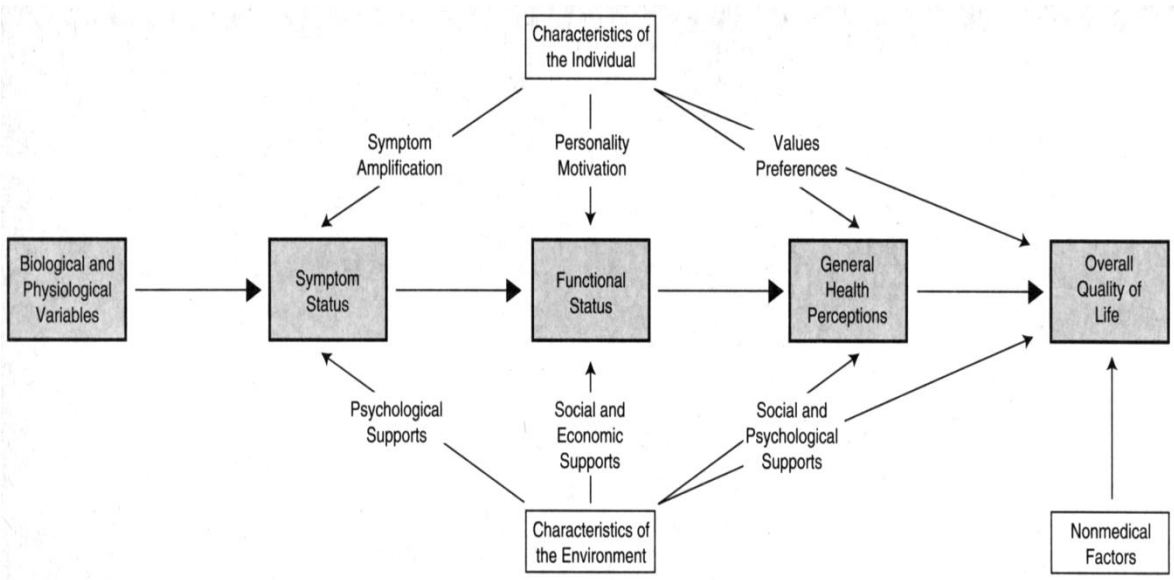


Figure 3-4: Wilson & Cleary (1995) A causal pathway model of health-related quality of life.

The above mentioned figure presented the relationships among measures of patient outcome in a health-related quality of life conceptual model (Wilson & Cleary, 1995) .

Brief description of main themes in Wilson & Cleary‘s model (1995) are presented as follows*:*

Main Themes in Wilson & Cleary (1995) Model

1. ***Biological-physiological variables:*** This includes any measurable function of cells, organs, and organ system and other clinical indicators related to the change in the function of organ and organ system of an individual. It emphasizes information related to diagnosis of diseases, physical examination, clinical laboratory assessments and medical history.
2. ***Symptom Status:*** Symptoms are defined as "a patient's perception of an abnormal physical, emotional or cognitive state". Symptoms of depression, anxiety and other mental states are included in this definition.
3. ***Functional Status:*** Functional status is characterized by the ability of an individual to perform specific tasks and functions. Performing the tasks such as going to work, routine household chores, keeping medical appointments are some of the indicators of functional status.
4. ***General health perception:*** General health perception of an individual is defined as an individual perception about his/her own health because of a specific disease or malfunctioning of an organ or body systems. General health perception is influenced by perceived symptoms and functional status.
5. ***Overall quality of life***: Overall quality of life is defined as the satisfaction of an individual with all the aspects of their life.

According to Wilson and Cleary (1995) there are certain factors which may have a significant impact at each level of the model. It was reported that patient's values, beliefs, and preferences have a significant effect on every stage especially on general health perception and overall quality of life.

1. ***Characteristics of the Individual*****:** Characteristics of the individual are the specific characters of a person such as sex, age, education, personality characteristics, ethnicity, and race (Wilson & Cleary 1995).
2. ***Characteristics of environment:*** Characteristics of environment integrate all the factors of the individual's surroundings such as social class, tangible recourses (family income), and intangible (perceived and received social support) resources (Wilson & Cleary 1995).

Figure 3-5: Main Themes in Wilson & Cleary (1995) Model

3.17 **Ferrans et al. (2005) revised model of Wilson & Cleary**

Although the Wilson & Cleary (1995) model does not explicitly define the influence of individual and environment, Ferrans et al (2005) revised the HRQOL model to better elucidate individual and environmental factors.Ferrans and Powers (1992, p. 29) define quality of life as ‘‘*a person's sense of well-being that stems from satisfaction or dissatisfaction with areas of life that are important to him/her*’’. Later, a paper by Ferrans (1996) revised Wilson & Cleary's model to clarify the elements of health-related quality of life (HRQOL). In this revision five major domains of HQOL were identified and explained the nature relationships between different them. These domains were health and functioning, psychological/spiritual, social, economic, and family (Ferrans, 1996). The model suggested that biological factors are also influenced by characteristics of both individuals and environment and non-medical factors were part of either individual or environmental characteristics and not a separate entity. Ferrans (1990;p) developed a taxonomy of the conceptualizations of quality of life in terms of six broad categories: “*(1) normal life, (2) social utility, (3) happiness/affect, (4) satisfaction with life, (5) achievement of personal goals, and (6) natural capacities”*.

Changes were made to Wilson and Cleary (1995) original model. First, it was indicated by arrows (Fig 3.6) given below which illustrates that biological factors are influenced by the characteristics of both individuals and the environment.

Biological functions were considered as broad concepts affecting body functions at cellular, molecular and organ level. Ferrans et al. (2005) reported that biological functions are affected by both the characteristics of individuals and environment. For example, some individuals are at high risk of developing a disease due to their genetic vulnerabilities. Similarly, certain environmental factors such as unhealthy life styles and exposure to germs in the environment predispose to different diseases and infections. Secondly, non-medical factors were deleted from the original model and it was emphasized that these factors are part of either individual or environmental characteristics. The labels on the arrows were also deleted, to avoid restricted characterization of the relationship. According to Ferrans et al. (2005), the revision in the model would facilitate the use of HRQOL in nursing and health care research and clinical practice.

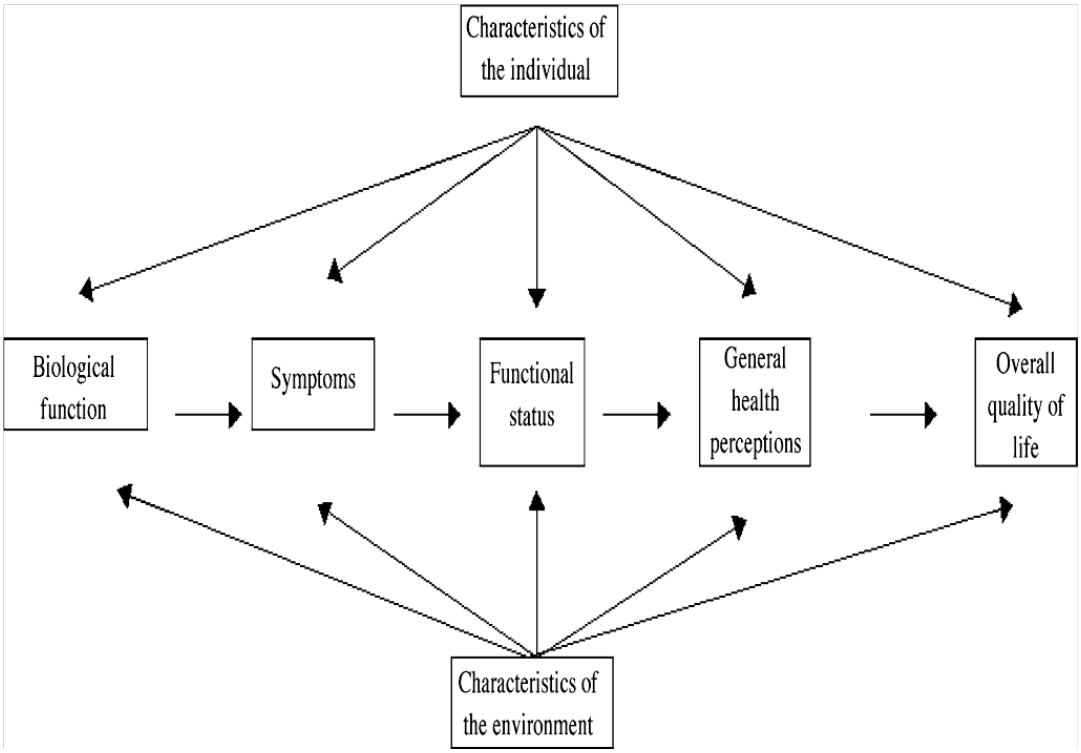


Figure 3-6: Revised Wilson and Cleary model (1995) for HRQOL (Ferrans et al 2005).

Bakas et al. (2012), based on their critical analysis of the literature, concluded that Ferrrans et al.(2005) revised model of Wilson and Cleary is the most appropriate model to be used as a guiding theoretical model in research and health care practice. It was also concluded that WHO- ICF (Zdrowia, 2007) model is also a HRQOL model. However it provides a classification framework rather than a guiding theoretical framework for hypothesis generating and testing. Therefore, this model would be less suitable as a guiding model for HRQOL research. It was further reiterated and emphasized that Ferrans et al. (2005) model is more comprehensive because characteristics of individuals and

environment were added and linked with the main domains to better understand the effect of psychosocial predictors on overall quality of life. According to Bakas et al (2012) the model also provides more opportunities for testing and further refinement and comparison of HRQOL concepts across different populations. In turn this would contribute to further advancement in the field of quality of life research and to interventions studies based on this model.

3.18 **Theoretical framework**

Keeping in view the above-mentioned critique on the models of quality of life, the theoretical model of Wilson and Cleary (1995), which was later modified by Ferrans et al. (2005) provided the theoretical underpinning for the present study.

Wilson and Cleary (1995) defined quality of life in terms of health related quality of life, a state of perceived health, and its effects on overall well-being of an individual. They provided a causal model for the identification of biological, psychological, and social factors associated with the quality of life of a person. It is a multidimensional and multidirectional causal model of HRQOL. All the components (biological/physiological factors, symptom status, functional status, general health perceptions, characteristics of individuals, and characteristics of environments) in the model influence each other in multidimensional ways. Ultimately these components predict and affect the overall quality of life of individuals.

Researchers have defined and operationalized all the major factors (biological/physiological factors, symptom status, functional status, general health perceptions, characteristics of individuals, characteristics of environment and overall quality of life) of Wilson and Cleary's (1995) model according to their study design and requirements.

The current study took into consideration the revised version (Ferrans et al, 2005) of Wilson and Cleary's model (1995). Since the study's aims and objectives were specified to certain predictor variables, the model was not fully tested and applied. The predictors and outcome variables (physical, psychological, social and environmental QOL) were included and operationally defined as per the research design and methodology of the current study.

In the present research biological and physiological variables were disease severity and comorbid diseases, which were noted from the patient's medical record. Characteristics of an Individual were defined as sex (categorized as male and female), age (measured in years), education (measured as), and Type D personality characteristics assessed with the distressed scale-14 (Denollet, 2005).

Characteristics of environment were defined in terms of family monthly income, family system, marital status, and social support. Family monthly income, family system, and marital status were measured with data demographic sheet. Social support in terms of support provided by family /others and perceived social support were measured with the social support scale (Gul & Najam, 2001).

Symptom, status was operationally defined as symptoms of anxiety and depression. The Hospital anxiety and depression Scale (Zigmond, & Snaith, 1983) was used to assess the symptoms of anxiety and depression in MI patients.

Overall quality of life is defined as satisfaction with different aspects of overall quality of life. Researchers have used different questionnaires and scales to assess overall quality of life. In the present study, overall quality of life was measured in terms of physical, psychological, social, and environmental quality of life. Quality of life was measured with World health organization quality of life brief (WHOQOL-BREF) Scale (The WHOQOL Group, 1998).

General health perception was measured with 1 and 2 of WHOQOL-BREF scale (The WHOQOL Group, 1998). These two items are measured separately from the rest of the subscales (physical, psychological, social, and environmental QOL) scores. These items were used to assess an individual perception of overall quality of life and perception of health /general wellbeing.

Figure 3-7 depicts the causal model for the psychosocial predictors of quality of life outcomes in the present research.

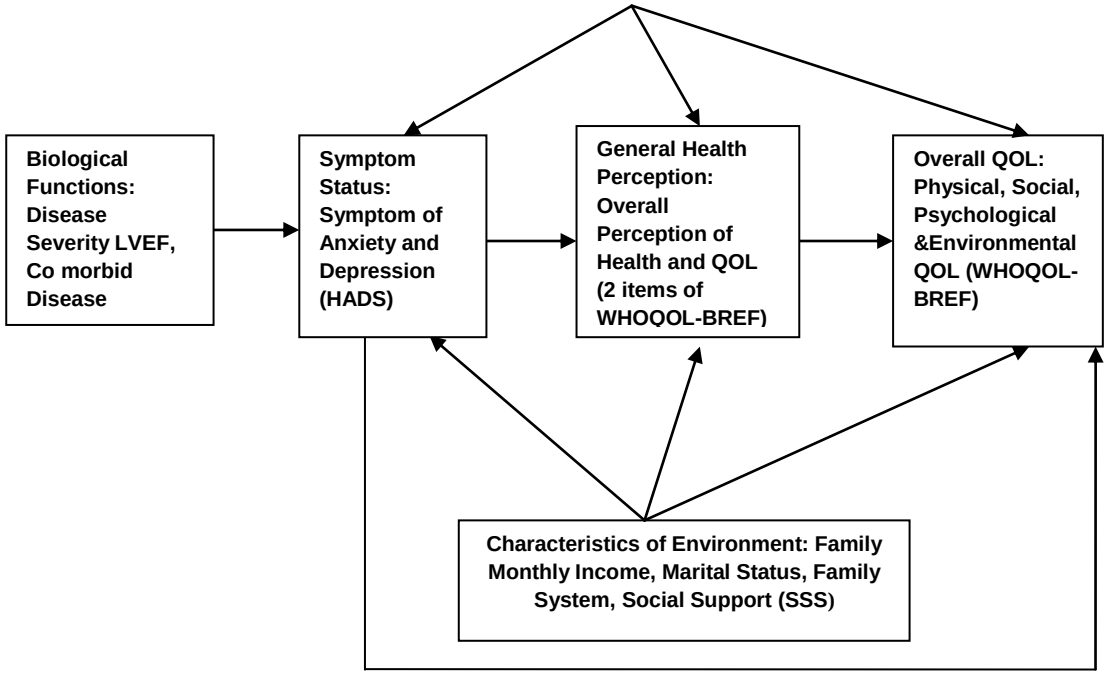


Figure 3-7: Conceptual model for psychosocial predictors of QOL in present study

4 Method

4.1 Introduction

The aim of the study was to explore psychosocial predictors such as Type D personality, anxiety, depression and social support in patients following a myocardial infarction. The research further explored the influence of these psychosocial predictors on quality of life of these patients. In Pakistan, this is the first study to explore four psychosocial variables in one sample of patients at 2 – 8 weeks (time 1) and 9 months (time 2) following a myocardial infarction.

This chapter describes the rationale for the present research, main aim and objectives of the study. It presents the preliminary feasibility study for the research which was conducted to assess the availability of the required sample and other methodological practicalities associated with administration of the questionnaires/scales, recruitment of the participants and data collection procedures. The study design and settings for the current study are also described in this chapter, providing the details of sampling and sample size, characteristics of the participants (inclusion/exclusion criteria) and recruitment of the participants. Details of the pilot study, procedures for data collection for the main study at baseline (2-8 weeks following MI) and 9 months follow up are also considered as well as a description of assessment tools used to measure predictor and outcome variables. Ethical considerations such as ethical approvals, confidentiality of the data and other related issues are also examined

in this chapter. The methods for statistical analysis are also described along with descriptions of assumptions for the statistical tests used in the analysis.

4.2 Rationale

Research in the West has clearly shown the significance of psychosocial factors in the development, progression and prognosis of disease such as myocardial infarction. Yet in Pakistan, this concept has not been extensively explored prospectively or, presumably, retrospectively, either. In Pakistan there is a focus on the medical aspects of MI with very little interest in the psychosocial correlates of life threatening diseases such as MI and their impact on the quality of life of patients post MI. Surveys carried out by the National Heart Foundation of Pakistan (2001) indicate high prevalence rates of cardiovascular disease with over 20% of the Pakistani population affected. In Pakistan there is a huge paucity of research in this area with only 12 publications on cardiovascular disease between 1991and 2001 (WHO, 2006). Only 8% of published cardiovascular research is from developing countries (WHO, 2006).

The literature review presented in this research has highlighted the importance of Type D personality as a determinant of adverse health outcomes following MI and the need for further prospective studies in cultures such as Pakistan to elucidate the role of personality in the aetiology and prognosis of heart diseases. As Type D personality has been identified as emerging risk factor for MI and future cardiac events, studies involving the construct of Type D personality would be helpful in identifying MI patients, who are in need of specialized psychosocial interventions to enhance compliance with treatment regimens and

cardiac rehabilitation programs. Cross-sectional research evidence from Pakistan has identified a very high prevalence (45%-67%) of Type D personality characteristics in MI patients and a significant association of Type D with post MI anxiety, depression (Bashir, 2009, Gul& Bhatti Ali 2009) and impaired quality of life (Naseer, 2007, Gul& Bhatti Ali 2009). The present prospective cohort study would play a crucial role in establishing Type D personality as a stable construct over a period of time (9 months) and its implications as a predictor of quality of life in MI patients.

A few cross-sectional studies have identified high prevalence of anxiety and depression in patients following a myocardial infarction in Pakistani population. A study conducted by Akhtar et al (2008) reported symptoms of anxiety and depression in 50% of patients following an acute myocardial infarction (AMI). A significant association was also found between post AMI depression, anxiety and psychosocial factors such as lack of close confidant. In another study (Bokhari et al., 2002) the point prevalence of depression was identified in 37% of patients with coronary artery disease in a tertiary care hospital in Pakistan. In a systematic literature review Mirza & Jenkins (2004) reported that mean overall prevalence of anxiety and depressive disorders was 34% (range 29-66% for women and 10-33% for men) in the community population in Pakistan. Analysis revealed socioeconomic conditions and relationship problem as major risk factors for anxiety and depression. It was also suggested that support from family and friends may protect against development of these disorders. Mumford et al(1997) estimated that 66% of women and 25% of men suffered from anxiety

and depressive disorders in rural areas of Pakistan. Significant association was found between economic adversity and psychological distress. Women living in unitary households reported more distress than those living in extended or joint families. Another study (Tauqi et al., 2007) identified nuclear family system as a strong independent predictor of depression in the elderly. The prevalence of depression was found to be 19.8% in the elderly (65 - 74 years) Pakistani population. Husain et al (2007) reported high prevalence (60% in women & 45% in men) of depressive symptoms from the North West Frontier Province (NWFP) of Pakistan. High level of depressive symptoms was associated with social problems, lack of social support and greater disability in a sample of 417 participants. Although few studies have identified the prevalence of anxiety and depression in cardiac patients, however the impact of these variables on quality of life has not been extensively explored with reference to Pakistani culture. Since the identification and significance of post MI anxiety and depression is neither acknowledged nor incorporated in cardiac rehabilitation programs therefore it important to examine the role of these factors in recovery and management of patients post MI.

The role of social support is an important factor in analyzing the way disease is experienced particularly as in Pakistan there is an emphasis on the moral obligation of providing social support for patients. As far as Pakistan is concerned, the extended family system is more prevalent within the culture than is typical in the West. The concept involves distant relatives in a grouping, which exists to provide social support for its members. Members of the extended family

support each other whenever needed, for example, by lending money, helping out when members are sick and so on. The importance of family and social support is inculcated in children from an early age and it is considered as an obligation to look after the older, vulnerable and sick members of the extended group (Jafar, 2003). However in European societies extended families do not function in this way, as they are dispersed in different parts of the country and cannot provide help and support to each other (Jafar, 2003).

On the other hand, in Pakistan too, some nuclear families in urban areas lack extended family support for the same reason mentioned above (Niaz, 2001). In a cross-sectional study (Itrat et al., 2008) four hundred participants (age: 65 and above) were interviewed about satisfaction with current family system, opinions about changing trends of family systems, and their implications on health. A total of 366 (91.5%) respondents were satisfied with their family system. 326 (81.5%) respondents reported that the trend is changing and people are turning towards nuclear family from joint family systems in Pakistan. It was also suggested that the family system has a significant impact on health care (Itrat et al, 2008). Therefore investigating the relationship of family system with cardiac outcomes (quality of life) would provide insight about interplay of socio-cultural factors associated with prognosis and management of MI patients. This research is unique in its attempt to examine the relationship between social support and MI in a society where social support, although usually available, may not be considered a significant factor in the rehabilitation of MI patients and therefore be taken for granted.

Outcomes of the research will provide clinical pathways for assessment of Type D personality traits, and other variables such as anxiety, depression and social support in patients with myocardial infarction. The research will provide a rationale for professional interventions which would strengthen the existing social networks. Such interventions could be of particular help in increasing compliance with medication and adherence to life-style interventions, thus improving the overall quality of life.

Type D personality characteristics, symptoms of anxiety and depression and lack of social support need to be considered in the risk stratification and treatment of post-MI patients. Therefore, psychological measures should be provided in the hospitals for the assessment of Type D personality characteristics, post MI depression/anxiety, low social support, and Quality of life of these patients. High-risk group for cardiac problems may be identified and appropriate prevention strategies may be used to reduce the risk of MI and other related diseases. It would also be helpful in identifying coronary patients, who are in need of specialized psychosocial interventions to enhance the compliance with treatment regime and cardiac rehabilitation programs.

This research will help provide guidelines for physicians on the importance of monitoring patients in terms of perceived social support thereby informing service provision for example in the treatment of post-myocardial infarction patients, low social support may also be routinely identified in addition to other psychosocial factors known to complicate the rehabilitation of cardiac patients.

Monitoring of patients with low social support might be an important first step in increasing the survival of patients after a cardiac event.

In light of the above factors along with the significance of family and social support systems within the cultural setting of Pakistan, the present research has been designed to identify the psychosocial predictors such as Type D personality, anxiety, depression and social support in patients following a myocardial infarction. It would further investigate the impact of the psychosocial predictors on the quality of life of these MI patients over the first post MI year, as this is the most significant time in terms of future cardiac events and mortality. It is recognized that the results of this study are unlikely to be generalized outside Pakistan. However, the findings may demonstrate the role of culture in understanding post MI recovery and provide a basis for comparing and contrasting the contribution of social support to the trajectory of recovery across cultures.

Given the dearth of research on this topic in Pakistan, this study will provide a baseline for future research projects thus advancing knowledge in this area. Research findings would also be disseminated through the publication of academic papers, contributions to conferences, and teaching at university level.

4.3 Aims

The aim of the study was to explore the psychosocial predictors such as Type D personality, anxiety, depression and social support in patients following a myocardial infarction. The research further explored the influence of these psychosocial predictors on Quality of life of these patients. The study was conducted in two phases. Initially baseline assessment was done at two weeks to eight weeks (time 1) following the first time diagnosis of myocardial infarction. Same patients were assessed again at 9 months follow up (time 2).

4.4 Objectives

The objectives of study are presented below.

i. To assess Type D personality characteristics at time 1 and time 2 assessment.
ii. To identify gender difference in terms of Type D personality between male and female participants at time 1 and time 2.
iii. To measure levels of anxiety and depression in MI participants.
iv. To assess symptoms of anxiety in Type D and non-Type D patients at time 1 and time 2 assessments.
v. To assess symptoms of depression in Type D and non-Type D patients at time 1 and time 2 assessments.
vi. To identify gender differences in levels of anxiety and depression at time 1 and time 2 assessments.

vii. To determine the relationship between sociodemographic, clinical and psychosocial variables with quality of life (physical, psychological, social & environmental QOL) at time 1 and time 2 assessments.

viii. To identify significant predictors of different dimensions of quality of life (physical, psychological, social & environmental QOL) at time 1 and time 2 assessments.

ix. To assess the difference in psychosocial variables between time 1 and time 2

4.5 Preliminary feasibility

A preliminary feasibility was conducted for selection of the sample. In this regard, different hospitals such as Armed Forces Institute of Cardiology/ National Institute of Heart Disease (AFIC/NIHD), Hearts International Hospital, Rawalpindi General Hospital (RGH) and Pakistan Institute of Medical Sciences, Islamabad (PIMS) were approached to assess the availability of data as per required criteria and feasibility of conducting a prospective cohort study in these major cardiac units. Interviews were conducted with Consultant Cardiologist to discuss inclusion/exclusion criteria and disease severity on the basis of the latest WHO criteria.

4.6 Pilot study

A pilot study was conducted prior to the main study. The aim, procedure and methods for the pilot study is described in this section.

*4.6.1 **Aim***

The main aim of the pilot study was to practically assess different procedures associated with the data collection and to ascertain the most reliable method of administering the questionnaires/ scales. The second aim was to assess the training of research assistant in data collecting procedures.

*4.6.2 **Procedure***

Two students each with a master's degree in Psychology/Behavioral Sciences were recruited as research assistants. They were trained by the researcher for data collection. These research assistants had prior knowledge and experience of working with CVD patients in the cardiology department during their internship as this was part of their degree requirements. They were extensively trained in building rapport with the patients and conducting interviews in their course on advance counseling skills. During the course they were trained with videos of experts conducting interviews with diverse patients. They were also given face to face training for building rapport and assessment of patients under the supervision of the researcher. They were briefed about how to provide information about the research, taking informed consent, administering the questionnaires/scales and other related procedures. After the initial briefing, the

researcher conducted the interview in the presence of the research assistants in order to familiarize them with the entire procedure and to deal with any issue which may arise during the interview and assessment procedures. They were told to immediately refer back to the attending cardiologist in case of any psychological distress which may arise during the interview or be identified on the basis of HADS scores. During the initial data collection the assistants collected the data in the presence of the researcher in order to ensure the quality of interactions with the participants.

They administered the same scales (DS-14, HADS, SSS & WHOQOL-BREF) on 30 participants and significant inter-rater reliability was found between the scores. The same recruitment procedures which were devised for main study (section 4.11) were followed in the pilot study and the patients were referred by the attending cardiologists on the basis of same inclusion and exclusion criteria (section 4.10.2).

4.6.3 ***Methods***

Initially Questionnaires/scales were administered on twenty patients for pilot testing. Ten patients were selected from Hearts International hospital (private) and ten were selected from Rawalpindi General Hospital (Government). Demographic sheet and all the four scales such as Type D personality scale, hospital anxiety and depression scale, social support scale and WHO quality of life brief scale were administered during the pilot testing.

No significant problem was identified in the administration of the questionnaires /scales. The patients were able to comprehend and respond to all the items in the questionnaires. However, during the pilot study, it was observed that majority of the patients preferred the questionnaires to be administered by the researcher /research assistant. The same preference was also reported in the previous research studies (Assad, 2004; Naseer, 2007, Gul& BhattiAli 2009) conducted on MI patients in Pakistan. Patients reported this method to be more convenient as completing the questionnaire on their own was more arduous for them. Moreover it was less time consuming, no missing data, ensured accuracy of the responses and better response rate. Any issue raised during the administration of the questionnaire was appropriately and timely sorted out by the researcher/research assistants. One set of questionnaires sheet with the response options was given to the patients. The researcher read each statement and the patients marked the options in their sheet.

4.6.4 ***Conclusion***

It took 40-50 minutes on average to administer all the questionnaires/scales. Patients preferred the questionnaires/scales to be administered by the researcher/ research assistant.Therefore it was decided that questionnaires/scales would be administered by the researcher / research assistants in a face to face interview and the same procedure would be followed for further data collection. The data collected during the pilot study was added to the main data.

4.7 Main study

The description about study design, settings, Sample and sampling strategies, participants, recruitment procedure, data collection procedure and measures used in the current study is given in this section.

4.8 Study design

The study was designed as an exploratory, prospective cohort study. A quantitative approach was followed to obtain the data at two time points, where MI patients were assessed within two to eight weeks (Time 1) after the diagnosis of myocardial infarction. The same cohort was again assessed at 9 months (Time 2) follow-up.

4.9 Study settings

Initially, on the basis of the feasibility study it was decided that the study would be conducted in Armed Forces Institute of Cardiology /National Institute of Heart Disease. AFIC/NIHD is a premier institute of the country with a state of art cardiac care both in Cardiology and Cardiac surgery. A large number of patients from diverse socioeconomic backgrounds visit this Institute to utilize the services provided by the Hospital. Therefore, availability of the data was not regarded as a problem. Formal permission was taken from the official authorities for data collection. However due to the present scenario in Pakistan in terms of a considerable increase in terrorist attacks and suicide bombings, especially against the military personnel and institutions, the hospital (AFIC/NIHD) was

following strict security procedures. Due to these procedures, civilian patients were reluctant to seek treatment in AFIC/NIHD and they were turning to other private and government hospitals. Similarly, since AFIC/NIHD comes under the jurisdiction of Armed forces of Pakistan, the hospital authorities were scrutinizing all research projects conducted within the premises. This would have further caused a delay in data collection procedures. Therefore keeping in view the repercussions due to stringent security procedures it was decided to change the venue for the data collection. The study area was changed from AFIC/NIHD and finally the data was collected from two major hospitals i.e. Hearts International hospital (private) and Rawalpindi General Hospital (Government) in order to have broader sample from different socioeconomic strata for base line assessment with the principle aim of drawing the comparison in terms of psychosocial issues related to MI.

4.10 **Sample**

This section of methods provides the details of sampling strategies, the characteristic of the participants (Inclusion/exclusion criteria) and the procedures that were undertaken for the recruitment of the participants.

4.10.1 ***Sampling strategy***

The aim of the sampling strategy was to recruit a representative sample. Raosoft software was used to calculate the sample size (Raosoft, 2004). The calculation gave a sample size of 297 with 95% confidence level, a response distribution of 50% and 5 % predicted margin of error. The main purpose of the

sample size calculation was to assess the number of participants needed to be the representative of the total population of the patients. It further helped in the planning of the study and setting the timelines for participant recruitment. It was decided to recruit equal number of male and female participants for gender comparison.

It was decided to collect a sample of 300 participants where 150 patients from Hearts International hospital (private) and 150 from Rawalpindi General Hospital (government) were sought. It was anticipated that the use of a private and a public hospital would result in a more representative sample than is usual in studies in Pakistan. The patients were selected from outpatient department (OPD) after two to eight weeks of diagnosis of MI. This time frame was selected so that patients have a clearer idea about the impact of the event on their lives and to avoid the confounding effects of hospitalization and other short term psychological implications due to sudden diagnosis of a life threatening disease.

All eligible patients (inclusion/exclusion criteria) referred by the attending cardiologist were approached consecutively. It was anticipated that the recruitment process for baseline assessment would be completed in 4 months. However, recruitment of participants took longer than expected and was completed in 6 months.

4.10.2 ***Participants***

A participants group of 150 males and 150 females was sought to have equal number of men and women for gender representation and comparison

.Individuals were approached if they fulfilled the following inclusion and exclusion criteria.

Inclusion Criteria

- First time-diagnosed MI patients with definite MI.
- MI patients (both gender) from the outpatient department (OPD), two to eight weeks after the diagnosis of myocardial infarction.
- Patients who were able to understand Urdu language.
- Able to provide informed consent.
- Age 18 years and above.

Exclusion Criteria

- Patients with MI as a result of coronary artery bypass graft surgery, angiography, angioplasty or any other surgical intervention.
- Severe life-threatening comorbid diseases (e.g. Cancer and HIV/AIDS).
- Cognitive impairments such as dementia and Alzheimer, limiting the ability of patients to participate in the study.
- Severe mental disorders

4.11 **Recruitment procedure**

Official Permission was taken from the authorities of Hearts International hospital (private) and Rawalpindi General Hospital (Government). Procedures

such as security clearance and official approval for data collection were pursued as per hospital's requirements/policy.

After the permission the patients were identified and referred by the attending cardiologist from the out-patient department of these hospitals on the basis of predetermined inclusion and exclusion criteria. The criteria (inclusion/exclusion) were extensively discussed with the cardiologists during the preliminary feasibility phase of the study (section 4.5).

The data was collected with the help of two research assistants with masters' degrees in Psychology/Behavioral Sciences. They were recruited and trained by the researcher in the techniques of data collection. They were been trained with the scales during the pilot study. The researcher and research assistants were in the outpatients department. Every consecutive patient who agreed with the consultant cardiologist to receive further information about the study was approached for recruitment. Information regarding the research was given to the patients who fulfilled the required inclusion criteria. The study information was given to eligible patients verbally and in a patient information sheet (appendix 3).

Majority of the people in Pakistan speak and understand the national language of the country i.e. Urdu. In the present research it was decided that the mode of interaction with the participants would be Urdu language. The translated and validated versions of all questionnaires/scales in Urdu language were used for data collection. Therefore patients who were not able to speak /comprehend Urdu were not included in the sample. A record was kept of the people excluded because of linguistic ability.

The basic information about the research project was given to the patients by the research assistants with the help of information sheet. All the questions and queries related to the project were answered and they were assured about the confidentiality of the information provided by them. It was mentioned in the information sheet and was further reiterated by the researcher that their participation was voluntary and they may withdraw at any point from the study. The majority of patients who fulfilled the required criteria agreed to participate in the study. However, they did ask a few questions about the reevaluation after nine months (time 2). The researcher/research assistant answered their questions and explained the purpose of reassessment which was also mentioned in the information sheet. The procedure for giving informed consent was also explained to the patients. It was especially ensured that patients understood that they had a minimum of 24 hours in which to decide whether or not to participate. However, the researcher took consent from and administered the questionnaires to those patients who spontaneously requested to complete the questionnaires during their current appointment.

The majority of patients agreed and signed consent (appendix 4) form for the administration of protocol on the same day when they were approached in the outpatient department of cardiology departments. These patients decided and responded within three hours while they were in OPD. Twenty eight patients took 24 hours to one week to respond to the questions, the questionnaires were administered on them either on the next day when they came for further test and procedures or within a week when they came again for follow up. Eight out of

these twenty eight patients consented the next day and questionnaires / scales were administered on them. Sixteen patients took the information sheet and consent form with them and responded with in a week time. They contacted the research/ research assistant and showed their willingness to participate in the study. Appointments were scheduled as per their convenience and the patients were assessed in the hospitals during their follow up visits .Four patients never returned or contacted the researcher/research assistant.

4.12 **Data collection procedures (Time1 & Time 2)**

4.12.1 ***Data collection at Time 1***

Face to face interviews were conducted and the questionnaires were administered by the researcher/research assistants. The intention was to use a personal approach to recruitment to ensure a higher recruitment rate. Research evidence has also suggested that face to face contact and personally administered questionnaires elicit the best possible response rate (McColl et al., 2001) . It was ensured that questionnaires/ scales were presented in the same order and uniformity was maintained throughout the data collecting procedure.

Three hundred and thirty six patients who fulfilled the required criteria were referred by the consultant cardiologists for recruitment as study sample. It also included the twenty participants from pilot study. Out of 336 patients referred twenty two patients did not consent to participate in the study. The details of the patients who refused to participate were given in the beginning of results (table

5.1). Seven patients were not able to understand and comprehend the questionnaires in Urdu language. These patients belonged to Khyber Pakhtunkhwa province and their native language was Pashto. Although they were able to speak some words and sentences in Urdu language, it was difficult for them to comprehend the questionnaires/scales in Urdu language. A record was kept of the people excluded because of linguistic ability. Three patients provided consent and participated in the assessment procedure, however they did not complete the questionnaires. One patient stated that the questionnaires were too lengthy and two others left without giving any reason. Four patients took an information sheet and consent form but never returned them or contacted the researcher/research assistant. Telephonic calls were made to check but they never responded.

During the interview two female patients started crying while the questionnaires were administered to them. One (age=36) was concerned about her children. She mentioned that it would be difficult for her to look after her kids due to her illness. After the reassurance from the researcher and the attending cardiologist, she was relieved and insisted on completing the assessment procedure. The other woman (age=40) was upset because of the financial constraints and cost of treatment. Since she was seeking treatment from hearts international hospital which is private institution therefore the cost of treatment was much higher as compared to Government hospital. Information regarding the treatment from government hospital such as Rawalpindi general hospital was also provided to

her. Afterwards she decided to complete the assessment procedure. Finally the data was collected from 300 patients.

As it was indicated in the ethical procedures (section 4.25) the code of ethics prescribed by the committee of ethics, University of Bradford (UOB), regarding involvement of human participants was followed in the present research. In any situation where concerning levels of anxiety and depression were observed among patients, the researcher engaged the cardiologist in debriefing along with the patient, with mutual informed consent. The researcher ensured that patients were made aware of their concerning levels by a process of individual debriefing followed by consultation with their attending cardiologist. The cardiologist took care of further referrals to psychiatrists / mental health professionals for appropriate psychological interventions needed at that time.

On average it took 40-50 minutes to administer the questionnaires / scales on each patient. The research assistants collected 50% of the data whereas 50% was collected by the researcher during the baseline Time 1 assessment period. This constituted the baseline assessment.

4.12.2 ***Data collection at Time 2***

Follow-up was conducted at 9 months (time 2) following the baseline administration. Telephone calls were made by the research assistants to check the availability and willingness of patients to participate in time 2 assessment.

The consultant cardiologist also contacted the patients for follow up and the researcher /research assistants administered the questionnaires on the patients in the hospitals .In case where the patient were not able to come to the hospitals, home visits were conducted by the researcher and the assistant. All the study questionnaires/scales were administered during time 2 assessment. Same procedure was followed and the questionnaires/ scales were administered by the researcher/ research assistants in a face to face interview.

All the 300 patients who completed time 1 assessment were contacted at time 2. The patients were contacted in the same sequence as time 1 assessment to ensure that the follow up period was 9 months for all the patients at time 2 assessment.

Twelve patients died before the follow up. Mortality data was collected from the family members and relatives of deceased patients. The cause and date of death was collected. 9 participants died due to second MI, 1 participant died due kidney failure and 2 died during coronary artery bypass graft (CABG) surgery. All the 12 patients died within 3 months of first time diagnosis of MI.

The data for the readmission was gathered from the participants and hospital records. A total of nine participants (n=9/191; 4.7 %) reported readmission in hospital. Reasons for readmission were angina (n=4); cardiac arrhythmias (n=2), worsening of MI disease severity (n=1) and coronary artery bypass grafting surgery (n=2). Fifty two patients declined to participate during time 2 assessment. They did not give any reason for refusal to participate at follow.

Forty six patients could not be either contacted or moved out of the city or country. In the total sample of three hundred participants recruited at time 1 (baseline), hundred and ninety one patients completed the time 2 assessments. The follow up rate of 63.7 % in the current study is comparable to follow up rate (62.6%) of Williams (2007) study on the psychosocial predictors of quality of life of patients with MI.

At time 2 assessment out of 191 patients, hundred and fifty one patients were assessed in the hospitals and forty were assessed at their homes. All the home visits were conducting by the researcher along with at least one research assistant. 60% of the data was collected by the researcher whereas 40% data was collected by research assistants.

There was no issue of personal safety for the researcher and research assistants, since the research was conducted in cardiac units of major hospitals with all the necessary facilities for safety and security of the institution and personnel working there. To ensure the safety and security of the researcher and research assistants, where home visits were made at follow up the researcher was accompanied by a research assistant and a driver who was instructed to check after the predetermined time period. Similarly a nominated person at the office kept regular checks during the home visits. A call-in, call-out procedure using mobile phones was also used.

The details of those participants who dropped out during time2 assessment and those who completed the assessment are given in results (table 5.6).

4.13 **Measures**

The description of the data collection measures (demographic sheet and instruments) used in the study is presented below.

4.13.1 ***Demographic sheet***

A sociodemographic questionnaire sheet was prepared by the researcher in consultation with the researcher's supervisors. Demographic variables such as age, sex, marital status, educational status, occupation, family monthly income and family system were noted by researcher and research assistants (appendix 5).

Sex was categorized as male and female. Actual age of each participant was recorded as continuous variable. Marital status was classified as married, widowed, and divorced/separated. Educational status was divided into six levels such as no educational qualification, primary (5^{th} grade) secondary (10 grade), intermediate (12 grade) bachelor and postgraduate level. Occupation was initially noted and afterwards categorized as housewife, employed full time, employed part time and unemployed/retired. Family monthly income was recorded in seven categories ranging from below Pakistani rupee (Rs) 20,000 to Rs 71,000 and above. Family system was divided in two categorize such as joint family system and nuclear family system. Joint family system is defined as "*comprising of number of patrilinially related nuclear families living under same roof, sharing immovable property*" (Orenstein, 1961, p, 341). It is also defined as *"two or more nuclear families that form a corporate economic unit*" (Levinson,

Malone & Brown, 1980, p 86) whereas "*nuclear family system consist of parents and their dependent children*" (Keesing, 1975, p 150). In a research study on perception of elderly patients and their attendants about family system, Itrat et al., (2008) grouped the family unit with single, married or unmarried individual in nuclear family system. The same classification was used in the current study and unmarried and single parent with dependent children were included in nuclear family system.

Clinical data regarding, MI disease severity and comorbid physical diseases was collected from patients' hospital records. In the current study, Left ventricular ejection fraction (LVEF) was used as an indicator for MI disease severity. LVEF was evaluated by cardiologists and categorized as normal, mild, moderate, and severe impairment based on the report of echocardiogram. Comorbid diseases were initially recorded and later grouped as one comorbid and two comorbid diseases for statistical analysis. Information about the smoking status was also collected from the patients. Smoking status was classified as current smoker, non-smoker and previous smokers.

4.13.2 ***Instruments***

This section describes the instruments used to assess psychosocial predictors and outcome variables. Translated and validated versions of all scales and questionnaires in national Urdu language were used in the current study. These scales/questionnaires have previously been used in patients with MI and other cardiovascular diseases in Pakistan (Gul & Najam, 2002; Bokhari et al., 2002;

Samad et al.,2002; Assad, 2004; Sarwar; 2004; Naseer ,2007; Bashir , 2009; Gul & bhattiAli, 2009) . Cronbach's alpha was calculated for each scale to assess the internal consistency of the scale scores in the present sample. Alpha reliability for each scale/ questionnaire for the present sample was presented using Cronbach's alpha along with description of each scale. Following table (4.1) presents the summary of questionnaires/scales used in the current study.

Table 4-1: Summary of the measures used for psychosocial predictors and outcome variables.

Predictors	***Name of Measure***	***Authors***	***Total number of items***	***Subscales***	***Rating scale***	***year***
Type D Personality	Distress Scale 14(DS-14)	Denollet	14	Negative affectivity(NA) Social Isolation	5-point scale ranging from 0(False) to 4(True)	2005
Anxiety	The Hospital Anxiety & Depression Scale(HADS)	Zigmond & Snaith	14	Depression Anxiety	4-point likert scale ranging from 0 to 3	1983
Depression	The Hospital Anxiety & Depression Scale(HADS)	Zigmond & Snaith	14	Depression Anxiety	4-point likert scale ranging from 0 to 3	1983
Social support	Social support scale(SSS)	Gul & Najam	31	Support provided by family & others Perceived social support	4 point scale ranging from 0(there is no such person) to 3(a lot) 5-point likert scale from 1 (strongly agree) to 5 (strongly disagree).	2002
Outcome variable Quality of life	World Health Organization Quality of Life Brief (WHOQOL-BREF)	WHOQOL group	26	Psychological QOL Physical QOL Social QOL Environmental QOL	5 point likert scale ranging from 1(very dissatisfied) to 5 (very satisfied)	1998

4.14 **Assessment of Type D Personality**

Type D (Distress) personality Type is characterized by the joint tendency to experience negative emotions (negative affectivity) and a tendency to inhibit these emotions while avoiding social contacts with others (social inhibition). According to Denollet & Conraads (2011, p.13) "*The Type D (distressed) personality profile refers to a general propensity to psychological distress that is*

characterized by the combination of negative affectivity and social inhibition." Research evidence has documented that a combination of high negative affectivity and social inhibition combine to form a personality Type which is referred as "distressed" or Type D personality (Denollet , 2005). Individuals with Type D characteristics are at increased risk of long-term cardiac events (Denollet, 2000; Denollet & Brutsaert, 2001). Studies have shown that patients with Type D personality characteristics are at increased risk of psychological distress in terms of depression, anxiety, and irritability and lack of well-being (De Fruyt & Denollet, 2002; Ketterer et al., 2002; Pedersen et al., 2004). Another study has revealed that Type D personality is associated with impaired quality of life, elevated levels of anxiety/depression and poor prognosis in patients with CVD independent of other biomedical risk factors such as disease severity (Pedersen & Denollet, 2006).

4.14.1 ***Distressed Scale 14: DS-14***

In the present research Type D personality was operationally defined as negative affectivity and social inhibition based on the scores of Type D scale (DS14). The 14-item scale evaluates Type D personality in terms of negative affectivity (NA) and social inhibition (SI). The two sub scales NA and SI consist of seven items each. The items of "NA" scale measure the tendency to experience negative emotions across times and situations. While "SI" measure the tendency to inhibit the expression of these emotions and behaviors in social interactions (Denollet, 2005). Examples of items measuring negative affectivity are "I often feel unhappy", "I take a gloomy view of things" and "I am often in a

bad mood". Examples for the social inhibition subscale are "I often feel inhibited in social interactions", "I would rather keep other people at distance" and "I am a closed kind of a person". Participants rate their responses on a 5-point likert scale ranging from 0 = false to 4 = true. The total score ranges from 0 to 28 for the "NA" and "SI" subscales each. The NA and SI scales can be scored ranging from 0 to 28 as continuous variables to determine these personality traits independently. Participants who score high on both the negative affectivity and social isolation scale with the combination of the cut-off score of ≥ 10 on both scales (that is NA ≥ 10 and SI ≥ 10) are classified as having Type D personality. It takes about 10-15 minutes to complete the scale. Item Numbers 2, 4, 5, 7, 9, 12, and 13 measure Negative Affectivity (NA) while item numbers 1, 3, 6, 8, 10, 11, 14, measure Social Inhibition (SI). The scoring is reversed for item numbers 1 and 3.). Type D is a brief and psychometrically strong tool for measuring Type D personality traits. Denollet (2005) reported high level of internal consistency with Cronbach's alpha of 0.88 for negative affectivity (NA) and 0.86 for social inhibition (SI) scale in coronary and hypertension subsamples.Test retest correlations are 0.82 and 0.72 for NA and SI respectively. This indicated the stability of Type D scale across time.

Denollet (2005) suggested that DS 14 is a brief scale which can easily be administered (appendix 6). It can be used in combination with other distress scales and cause minimal burden to patients. Pedersen et al (2006) established the cross cultural validity of Type D construct in German, Italian, Belgian and Danish population. Validity of Type D personality has also been established in

Chinese (Yu et al, 2010) cardiac patients. Another research showed that Type D personality is stable over period of time and is independent of disease severity and other mood states such as anxiety and depression (Martens et al, 2007). Numerous studies have recommended the use of DS14 for the assessment of Type D personality traits in cardiac patients (Albus et al, 2004; Denollet , 2005; Pedersen et al 2006). In the present research the translated and validated version of Type D scale (Gul & BahttiAli, 2009) in Urdu language was used to assess Type D personality traits. An appropriate alpha reliability with cronbach's α of 0.75 for the negative affectivity and .074 for social inhibition subscale was reported in a sample of MI patients (Gul & BahttiAli, 2009). In the present research Type D personality scale had a high level of internal consistency, as determined by a cronbach's alpha of 0.83.

4.15 Assessment of Anxiety and Depression

Distress such as depression and anxiety is common in patients suffering from MI. Depression refers to clinically significant symptoms of depression and not merely low mood and feelings of sadness (APA, 2013). People often experience psychological distress (anger, sadness, guilt, anxiety) after being diagnosed with life threatening chronic diseases. These feelings usually lessen and subside with the passage of time. However, patients who keep on experiencing emotional distress may develop clinical depression. Studies have shown that significant symptoms of depression are present in patients recovering from a myocardial infarction (MI) and are associated with mortality and other CVD events (de Jonge et al., 2006a; Frasure-Smith & Lespérance, 2003; Gottlieb et al., 2004). In

addition to depression comorbid symptoms of anxiety are also common in patients with acute myocardial infarction and may persist for months subsequent to MI (Januzzi et al., 2000; Moser et al., 2002; Newman, 2003). Assessment and treatment of anxiety is important at early stages of AMI to prevent potential complications that may be aggravated by anxiety and to provide comfort to patients because it is associated with increased morbidity and mortality (Dube, 2004). Higher levels of anxiety also adversely affect physical functioning; interfere with role performance and role fulfillment. Furthermore, anxiety is a significant predictor of depression in both men and women with heart disease.

4.15.1 ***Hospital Anxiety and Depression Scale: HADS***

In the present research anxiety and depression was measured with translated and adapted version of hospital anxiety and depression scale in Urdu (Mumford et al., 1991). The scale was initially developed for patients in a general medical outpatient clinic, and it is sensitive to physical symptoms such as fatique, body aches/pains and sleep disturbance which may be associated with medical illness (Zigmond and Snaith, 1983, Snaith , 2003; Dickens et al., 2004). Although, the researchers (Lane et al., 2002; Barefoot et al., 2003) have used Beck Depression Inventory to assess post MI depression, but the reported prevalence of depressive symptoms was high when it was based on BDI as compared to HADS (Mayou et al., 2000; Martin et al., 2003). It is because of the fact that somatic symptoms of BDI may overlap with the somatic symptoms of MI. Therefore, in order to avoid this confounding effect, HADS was used to assess anxiety and depression in the current study.

Symptoms of depression and anxiety were measured with HADS which was originally developed in English language(Zigmond & Snaith, 1983)(appendix 7). It has been found to be a reliable instrument for detecting states of depression and anxiety in the hospital settings, medical outpatient clinic, community and primary care (Snaith 2003). The HADS has also been validated for use with adolescents, somatic and psychiatric cases; primary care patients and the general population (Bjelland et al., 2002; Snaith, 2003).The HADS contains 14 items and consists of two subscales: anxiety and depression. It is a 4-point rating scale with fourteen items. Seven items of the scale are representative of Anxiety and seven items are representative of Depression. Item numbers1, 3, 5, 7, 9, 11 and 13 assess anxiety while Item numbers 2, 4, 6, 8, 10, 12 and 14 measure depressive symptoms. Examples of items measuring depression are “I have lost interest in my appearance” and “I feel as if I am slowed down”. Examples of items measuring anxiety are “I feel tense and wound up” and “I get sudden feelings of panic”.

Each item is rated on a four-point likert scale ranging from ‘no not at all’ (score=0) to ‘yes definitely’ (score=3) giving maximum scores of 21 for anxiety and depression each. Higher scores on each scale indicate higher levels of symptoms of anxiety and depression. Scoring is reversed for HADS anxiety item number 7and it is scored ‘yes definitely’ (score=0) and ‘no not at all’ (score=3). Similarly scoring was also reversed for four items (2, 4, 6, 12 and 14) of HADS depression scale ranging from ‘yes definitely’ (score=0) and ‘no not at all’

(score=3). The total score for anxiety is obtained by adding all the scores on the individual items of the anxiety subscale. Same is done for the overall score on the depression subscale. Hermann (1997) used the combined scores of HADS anxiety and HADS depression which was referred as psychological distress.

Scores of 11 or more on either subscale are considered to be a significant 'case' of psychological morbidity, while scores of 8–10 represents ‘borderline’ and 0–7 ‘normal’ psychological functioning (Snaith, 2003).Researchers have used different cutoff scores for HADS scale to categorize the levels of anxiety and depression. A score of ≥8 may be used to determine caseness on both subscales, as a review has suggested that this cut-off score yields an optimal balance between sensitivity and specificity (Bjelland , et al., 2002) . Dickens et al. (2004) used a score >17 as cutoff on the total score of HADS (psychological distress) in a sample of MI cohort. They identified that HADS psychological distress of >17 had significant specificity (84.7%) and sensitivity (87.7%) as compared to psychiatric interviews for the assessment of psychological distress(Dickens et al., 2004). According to Hermann (1997) Zigmond and Snaith suggested cutoff scores of 7 to 8 for possible depression/ anxiety, and a score of 10 to 11 for probable anxiety/ depression in their original paper on HADS. However there is no single mutually accepted cutoff scores for HADS.

HADS is a screening tool for symptoms of depression and anxiety. High scores of anxiety and depression on HADS scale are only indicative of probable anxiety or depression and further clinical assessment is mandatory for the clinical

diagnosis of anxiety and depression (Herrmann, 1997). No formal training is required for the administration of HADS and it takes 5-10 minutes to complete the scale. HADS is a valid and reliable instrument which has been used across the world to assess psychological distress (anxiety& depression) in cardiac patients (Herrmann, 1997; Herrmann et al., 2000; Mayou et al., 2000) and general population (Lisspers et al., 1997; Spinhoven et al., 1997; Bjelland et al., 2002). In another research Barth & Martin (2005) identified three underlying constructs in German version of HADS. The constructs are psychic anxiety, psychomotor agitation and depression. It was concluded that HADS may serve as a significant screening tool with two subscales of anxiety and depression. However, investigating the three constructs model in clinical trials may prove to be useful in the interpretation of individual results of patients with somatic illness (Barth & Matin, 2005).

The adapted and translated version (Mumford et al., 1991) of HADS in Urdu language for Pakistan was used in this research to assess anxiety and depression (appendix 7). The Urdu version of HADS scale used the same cutoff scores of 11 or more on either subscale as significant 'case' of psychological morbidity, score of 8–10 ‘borderline’ and 0–7 ‘normal’ psychological functioning . In the current research the same cutoff scores were used to interpret HADS anxiety and depression results. HADS have also been used with MI patients in Pakistan (Bokhari et al., 2002; Samad et al.,2002; Gul &Bhatti Ali, 2009, Bashir, 2009)

In the current study both the subscales of HADS (depression and anxiety) were internally consistent with cronbach's α of 0.76 and 0.73 respectively. The HADS was administered both at time 1 and time 2 assessments.

4.16 Assessment of Social Support

Social support can be defined as "perceived or actual instrumental and/or expressive provisions supplied by the community, social network and confiding partners" (Lin, 1986, p. 18). Cobb (1976 p. 300) defined social support as "information leading the subject to believe that he is cared for and loved, valued and esteemed, and a member of a network of mutual obligations." In a systematic review and meta-analyses on social support and coronary heart disease, Barth et. Al. (2010) identified social support as the total amount of support/aid an individual receives from and perceives in the social network.

A supporting network of friends and family can play a crucial role in the advent of a sudden stressful event such as heart attack or myocardial infarction. Social support plays a crucial role in the aetiology and prognosis of life threatening conditions such as myocardial infarction. Research evidence have suggested that future researchers should include comprehensive measures of received and perceived social support with various domains of social provisions and network support (Curtona & Russell, 1987; Lett et al., 2009; Uchino 2009).

4.16.1 ***Social Support Scale: SSS***

In the present research social support was operationally defined as the support provided by family members and other(received social support) and perceived social support based on the scores of Social support scale (Gul, Najam, 2002).

Social support scale was developed and validated on Pakistani population .The scale has good psychometric properties and it has been used in different studies on MI patients, patients with chronic diseases and normal population (Gul & Najam, 2002). It is based on the Duke social support and stress scale (Parkerson et al., 1991), Social provision scale (Cutrona & Russel, 1987) and Berlin Social Support Scale (Schwarzer & Schulz, 2000). The Social support scale was designed to be used as a brief, easy to administer, tool of social support. The SSS consists of 31 items and comprises two parts which measure the social support in terms of support provided by family members and others and perceived social support. Part 1 measures the social support provided by family (spouse, children, grandchildren, parents, relatives, brothers and sisters) and others (friends, neighbors, co-workers and other groups). The second part of the scale assesses perceived social support in terms of nurturance, attachment, reassurance of worth, reliable alliance and social integration. The first part of the scale consists of 11 items scored on four point rating scale i.e. “there is no such person” (0) “none” (1), “some” (2) and “a lot” (3). The second part of the scale consist of 20 statements, which measure perceived social support in terms of nurturance (items, 3,10&11), attachment (items 1,4,8,13 & 15), reassurance of worth (items 14 &17), reliable alliance (items

2,5,6,7,9,12&16) and social integration (items 18,19 &20). Response Options are 5-point likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). Scoring is reversed for the negative items (items1, 6, 11, 12) as 5 (strongly agree) to 1 (strongly disagree). Examples of items measuring perceived social support are “I have at least one good friend whom I can trust” (reliable alliance), “There are person/persons who admire my talents and abilities” (reassurance of worth),” I feel loved” (attachment), I like to be with someone whenever I am sick (nurturance)” and I like to attend social gatherings” (social integration). Higher scores on the overall scale reflect higher levels of social support (perceived social support and support provided by family members and others). Social support scale is a reliable and valid measure for assessing social support in MI patients (Gul & Najam, 2002). In the present study, the alpha reliability of the Social support scale is 0.87 indicating a significant internal consistency of the scale. The English and Urdu versions of the scale are attached as appendix 8.

4.17 **Assessment of Quality of Life**

The significance of quality of life in health care research can be traced back to the work of the World Health Organization. The WHO QOL Group (1995, p. 1405) defines QOL as ‘‘*individuals’ perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships and their relationship to salient features of their environment".*

According to Saxena et al (1997) the above mentioned definition of quality of life provided the conceptual framework for the assessment of quality of life by WHO in health care. Later on spirituality/personal beliefs/religion was further added as one of the domain of QOL. WHO, in its assessment for QOL focuses on the generic aspects of QOL rather than the disease specific symptoms and side effects of treatment. Although WHO recognize the significance of these factors on people's QOL however they have attempted to assess these aspects through their impact on the significant core domains and facets . These domains are physical, psychological, level of independence, social relationships, environment, religious/personal belief, overall quality of life and general health (Saxena et al., 1997).

4.17.1 ***World Health Organization Quality of Life Brief: WHOQOL-BREF***

In the present study quality of life was operationally defined in terms of social, physical, psychological and environmental dimension of quality of life based on the scores of WHOQOL-BREF (The WHOQOL Group, 1998).

It is a short and abbreviated version of the WHOQOL-100, which consists of 26 items and measures overall quality of life in terms of physical, psychological, social and environmental dimensions. It was developed by WHOQOL (1998) group with fifteen international field centers. There are specific items for measuring each of these dimensions. It is available in more than 40 languages, including Urdu. WHOQOL-BREF can be self- administered, where respondents have enough ability to respond independently. The scale identifies the

dimension of quality of life most affected by the disease. The scoring is done on five point likert scale ranging from 1-5, where 1 stands for very dissatisfied and 5 for very satisfied. High score on the scale is an indication of good quality of life of an individual. Four domain scores denote an individual's perception of QOL in each particular domain. According to WHOQOL (1998) group, physical domain measures pain/discomfort, mobility, daily life activities, sleeping patterns, fatigue & level of energy, use of medications & other medical instruments. Psychological domain examines, negative & positive feelings, body image, self-esteem, memory, concentration and personal beliefs of an individual. Social domain is related to social support, social and personal relationships while environmental domain of quality of life includes the physical & home environment, opportunities for recreation, acquiring new skills and facilities for personal safety and security.

Items for each domain are as follows: physical domain consists of items numbers 3, 4, 10, 15, 16, 17 and 18. The psychological domain includes item numbers 5, 6, 7, 11, 19 and 26 whereas the social domain comprises items numbers 20, 21 and 22 and the environmental domain consists of items numbers 8, 9, 12, 13,14,23, 24 and 25. Example of questions for physical domain are “How satisfied are you with your capacity for work?” and “How satisfied are you with your sleep”, Examples of questions for psychological domain are “How well are you able to concentrate?” and “How satisfied are you with yourself?”. Social domain consists of questions such as “How satisfied are you with your personal relationships?” and “How satisfied are you with the

support you get from your friends?" Whereas environmental domain comprised of questions such as "How well you are satisfied with the conditions of your living place?" and "How satisfied are you with your access to health services?" There are two items, which are examined separately (Q1 and Q2), which address the general health and overall QOL (The WHOQOL Group, 1993). Question 1 ("How would you rate your quality of life?") assess the satisfaction with overall quality of life it says and question 2 ("How satisfied are you with your health?") measure the overall satisfaction with the health (appendix 9).

The domain scores for the WHOQOL-BREF are calculated by taking the mean of all items included in each domain and multiplying by a factor of four. These scores are then transformed to a 0-100 scale. In the present research, adapted and translated version (Khan et al., 2003) of WHOQOL-BREF in Urdu language was used to assess quality of life in patients with myocardial infarction(appendix 9).

4.18 **Ethical procedures**

This study was carried out in Pakistan and the researcher followed the best practice as carried out in Pakistan. However, due consideration to the ethical and governance requirement of the UK was also given. First of all ethical approval was formally sought from the University of the Bradford (UOB) committee for ethics in research. A detail application along with patient's information sheet, informed consent form, research proposal, and validated questionnaires was submitted to the committee. The project was extensively

reviewed by the committee. Few issues related to data collection were raised which were appropriately addressed by the research supervisors.

After the approval was granted from the committee of ethics in research (UOB), official authorities of Hearts International Hospital, Rawalpindi, Pakistan and Rawalpindi General Hospital (RGH) Pakistan were approached for formal approval of data collection. This was followed by the submission of application along with the letter from supervisor, and research proposal to the hospitals authorities. The project was approved by the hospital administration and scientific committees and the researcher/research assistants were allowed to collect the data from outpatients department of cardiology wards. Letter of ethical approval from University of Bradford is attached as appendix 2 .

Due to the confidential nature of this research strict procedures were implemented and followed to ensure confidentiality and anonymity of personal data provided by the patients. All those patients who agreed to participate in the study were given study identification (ID) code numbers. These ID codes were mentioned on all written and electronic database such as consent forms, demographic sheet and quantitative data base.

Patient data was entered into an SPSS database in anonymised form. Patient identifiable demographic details were kept in a separate database for purposes of follow-up and this data was linked to the anonymised data by means of ID code numbers. Data for patients who did not complete follow-up was retained unless they indicated that they wish to withdraw their data, in which case the

data would be removed from the database. The hard paper data was stored in a locked cabinet, within locked office, accessed only by researcher. The researcher was the custodian responsible for the safety and confidentiality of research data and study documentation.

The researcher has previous experience of working with MI patients during her Masters and MPhil research and has found no obvious potential for major physical or psychological harm to the participants. Moreover the current study was a non-interventional study therefore ethical risks associated with participating in the study were relatively small. However, in case of minor psychological distress, which might have been caused while talking about personal issues, it was decided the researcher would offer to refer the respondent back to the attending cardiologist with a view to referral for further support. To prevent undue distress, the patients were told in the beginning of the recruitment procedure that their participation was voluntary and they have the option to withdraw from the study at any time. This was also mentioned in the consent form.

No such studies on psychosocial predictors associated with myocardial infarction were being conducted in the hospitals selected for the present research. So these patients were not involved in similar kind of studies. Therefore, there was no risk of over exposure of the participants. During the administration of screening questionnaires for psychological distress such as hospital anxiety and depression scale, the responses of the patients would identify the patients with clinically significant levels of anxiety and depressive

symptoms. In this case where patients were identified with high levels of depression and anxiety symptoms they would be offered and advised to refer back to attending cardiologist for appropriate support and treatment.

4.19 **Statistical Analysis**

The statistical analysis was performed with statistical packages for the social sciences (SPSS version 20.0). Data was cleaned and screened for missing values by checking the frequencies of responses on all variables. To ensure whether data entered was accurate as per the responses, data was entered independently by the researcher and a research assistant and then findings were matched between the two data sets. This comparison identified nine out of three hundred cases (3% of 300) with discrepancies in their values. The original values of these cases were traced back from the original forms and hence corrected. Baseline demographic and clinical characteristics of the sample were described. Frequencies and percentages were used for categorical data (i.e., gender, family system, marital status, education, occupation, monthly income, smoking status, comorbid disease and Type D personality). Mean and standard deviations were used for continuous data i.e., age and scores on the scales. Descriptive statistics were used to identify the symptoms of anxiety and depression in MI patients. HADS Cutoff scores of 11 or more on either subscale as significant 'case' of psychological morbidity, score of 8–10 ‘borderline’ and 0–7 ‘normal’ psychological functioning were used for assessment of anxiety and depression(Mumford et al., 1991) . Similarly frequency and percentage for Type D personality characteristics were calculated by using the recommended cutoff

score of ≥10 (Donollet, 2005) on both Negative Affectivity (NA) and Social Inhibition (SI) subscale. Descriptive statistics was also used for the assessment of levels of social support based on the scores of social support scale. High scores on social support scale reflected high level of social support. Median was used to identify the cutoff score for high and low level of social support (Gul & Najam, 2002).

Correlations, means and standard deviations (SD) were calculated for the relationship of sociodemographic, clinical and psychosocial variables with quality of life (physical, psychological, social, & environmental QOL) at time1 and time 2 assessments post MI. Correlation test were selected on the basis of Type of variables. Pearson's correlation coefficient was used for continuous variables, Spearman rho was used to compute the correlation between ordinal and continuous variables. While point bi-serial correlation was used for dichotomous and poly-serial correlation was used between variables having polychotomous data. The description for Type of variables and correlation test used is presented in (table 5-24) the results of the current study.

A series of regression analyses were conducted to identify the significant determinants of quality of life. Underlying assumptions were inspected for each regression model. A hierarchical regression analysis was carried out to identify the significant predictors after controlling for sociodemographic and clinical variables. This analysis generated significant predictors for each subcomponent of quality of life (outcome variable) i.e., physical, social, psychological, social, and environmental QOL. Before the hierarchical multiple regression analysis

was performed, the variables were examined for assumptions required for hierarchical multiple regression to provide valid predictions. These assumptions were helpful in testing the objectives and how well the regression model fits the data. It also provided evidence for accuracy of the predictions and the variations in dependent (outcome) variable caused by independent variables (predictors). If these assumptions are violated the data need to checked and transformed to meet the necessary criteria and to retest the assumptions. If the data still grossly violate the basic assumptions for hierarchical multiple regression analysis the alternative statistical techniques should be explored for further analysis.

4.20 Hierarchical Regression Analysis

Hierarchical regression analysis would be used if follow assumptions are met.

4.20.1 ***Assumptions for Hierarchical multiple regression***

1. Sample size (adequate sample size required to run hierarchical multiple regression analysis).
2. Independence of observation for errors (residuals).
3. Linearity (a linear relationship between the predictor variables and the dependent variable).
4. Homoscedasticity of residuals (equal error variances).
5. Multicollinearity
6. No significant outliers or influential points.
7. Normality (residuals are normally distributed)

Sample Size

An adequate sample size is essential to run regression analysis. Different researchers suggested various guidelines for appropriate sample size for regression models. For regression analysis to fulfill the assumption of sample size we used the assumption of 15 participants per predictor (Stevens, 1996) and the following formula ((Tabachnick Fidell, 2007) was also used to calculate the sample size.

$$N > 50 + 8m$$

N = number of Participants (300)

m = number of IVs (14)

IVs= independent variables

$$300 > 50 + 8(14)$$

$$300 > 162$$

Therefore the sample size in the current research meets the assumption of sample size requirement for multiple regression equation.

Independence of observation

In order to assess independence of observations for errors (residuals), the Durbin-Watson statistic was calculated. The Durbin-Watson statistic can range from 0 to 4. The values that are close to 2 indicate no correlation between the residuals (Laerd, 2013). In the current research the Durbin-Watson statistic was calculated for each regression model. The results are mentioned along with

regression tables. The Durban Watson values are within the desired range (approximately 2).

Linearity

An assumption of multiple linear regression is that individually and collectively all the independent variables are linearly related to the dependent variable. This assumption was tested by plotting a scatter-plot between studentized residuals against unstandardized predicted values. Data analysis showed that the residuals form a horizontal band, which revealed that relationship between independent variables and dependent variable (physical, psychological, social & environmental QOL) is likely to be linear (appendix 11&12).

Homoscedasticity of residuals

Homoscedasticity also describes the distribution of the scores and the relationship between the variables. The assumption of homoscedasticity is that the variance of the residuals about predicted dependent variables scores should be equal for all predicted scores. Homoscedasticity can also be checked by the above mentioned scatter-plot between studentized residuals and unstandardized predicted values. It is evident from the plot (appendix 11&12) that the residuals were equally spread over the predicted values of all the domains (physical, psychological, social & environmental QOL) of dependent variable which means that the assumption of homoscedasticity had not been violated.

Multicollinearity

Collinearity diagnosis was performed to identify any issue with multicollinearity which might not have been identified in correlation analysis. The values of tolerance and variance inflation factor (VIF) were examined. Tolerance is an indication of variability of one independent predictor which is not explained by other independent predictor/variable (Pallant, 2007). VIF is the reciprocal of Tolerance (i.e. 1 divided by Tolerance). The Tolerance value of less than 0.1 (i.e. VIF of greater than 10) is an indication of multicollinearity. Results of the variance inflation factor VIF (all less than 10) and collinearity tolerance (all greater than 0.1) suggest that the estimated βs (standardized coefficient) are well established in the following regression models (appendix 11&12).

Outliers

Multiple regression analysis is very sensitive to outliers. According to Tabachnick & Fidell (2007, p.128), outliers are those cases with the standardized residual values greater than +3.3 standard deviations. In our data the casewise diagnostics tables (appendix 11 & 12) revealed very few cases with standardized residuals values more than $\pm$3.3 standard deviations, therefore, it was decided to retain these outliers**.**

Normality

The assumption of normality suggests that the residuals should be normally distributed about the predicted dependent variable scores. Normality of the

scores was also initially checked during the data screening process and appropriate procedures were used to transform the data (table5.22). This assumption was also checked with P-P plot and a histogram with normal curve (appendix11 &12), produced as a part of the regression procedure for all the domains of quality of life. Inspection of the histogram reflected approximately normally distributed residuals. The P-P plots also demonstrated that the points were very close to the diagonal line suggesting that the residuals are close to normal for further regression procedures.

Paired sample t test was used to examine changes in psychosocial predictors (Type D personality, anxiety, depression & social support) and quality of life between time 1 and time 2 assessments. Descriptive statistics and Chi-square analysis was done to assess the differences between subgroups such as Type D and non-Type D individuals and gender at time 1 and time 2 assessments.

4.21 T Test Analysis

Following assumption (Lared statistics, 2013) were assessed for each variable before running the paired sample t test analysis. T test would be undertaken if following assumptions are met (appendix 13).

4.21.1 ***Paired Sample T Test.***

Assumptions for paired sample T test.

Assumption 1

Assumption 1 and 2 are related to level of measurement. Parametric techniques such as t tests assume that the dependent variables are measured on continuous scale (ratio or interval data) (Phallant, 2007). In this research the psychosocial variables such as Type D personality, depression, anxiety, social support and quality of life are measured on continuous scale.

Assumption 2

The second assumption is related to the level of measurement of independent variable. The independent variable should consist of two categorical or related groups. Related groups mean having the same participants in each group when two groups are assessed on two different points in time (Laerd statistics, 2013). For example, in the current study the same cohort of MI patients were assessed at two points in time i.e. baseline assessment (time1) 2-8 weeks of diagnosis of MI and 9 months follow up (time 2).

Assumption 3

Assumptions 3 & 4 are related to the nature of data. Assumption 3 is related to outliers in the data. According to this assumption, there should be no significant outliers in the differences between the scores of 2 related groups. In the current study outliers were assessed with the help of boxplot. In SPSS any data points that are more than 1.5 box lengths from edge of their box are identified with a

circle and classified as an outlier. Similarly in a boxplot the data points which are 3 box length away from the edge of their box are called extreme outliers and are represented by an asterisk (*) (Laerd statistics, 2013).

Assumption 4

Assumption 4 is related to distribution of scores on differences between 2 related groups. According to this assumption the distribution of scores on difference between the 2 related groups should be normally distributed. The assumption of normality was tested by inspecting histograms and by computing Z scores form the values of skewness and kurtosis for each variable. If the z scores fall within ±2.58 the data would be considered as normally distributed at statistical significance level of .01(Laerd, 2013). However most parametric techniques, such as t test, are fairly 'robust' or tolerant to the violation of assumption of normality (Phallant, 2007) and in the case of large sample sizes (30+), the violation of assumption of normality should not cause major problems in the analysis and interpretations.

Following assumption (Lared statistics, 2013) were assessed for each variable before applying paired sample sign test.

4.21.2 ***Paired Sample Sign Test Analysis***

Assumptions form Paired Sample Sign Test Analysis

Assumption1

It is related to the measurement level. According to this assumption the dependent variable should be measured on continuous (ratio, interval) level. In this study, the dependent variable, which is social support, is measured on a continuous level.

Assumption 2

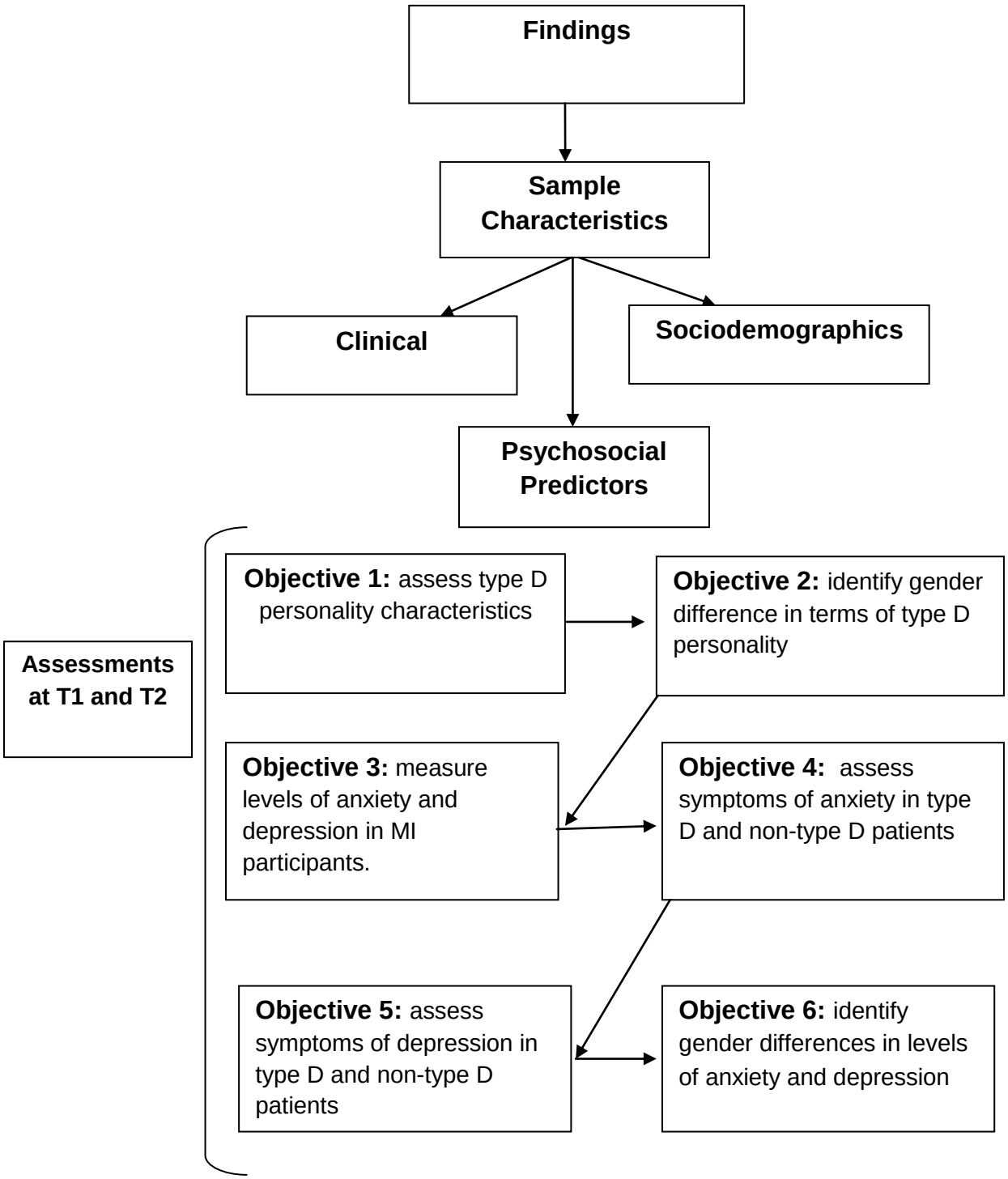
The independent variable should consist of two categorical or related groups. In the current study social support was assessed in same MI patients at two points in time i.e. at baseline within 2-8 weeks of diagnosis of MI and 9 months follow up. Therefore the two groups of same MI patients are related and it is a paired sample.

Assumption 3

The scores for each participant at time 1 and time 2 should be independent and the scores of one participant should not influence the scores of other participant. In the current study the data was collected on individual basis and it was ensured that the scores of one participant did not influence the scores of other participant.

4.22 **Summary of Data Analysis at Time 1 and 2**

Following flow chart present the summary of the data analysis procedures at time 1 and time 2 assessment.



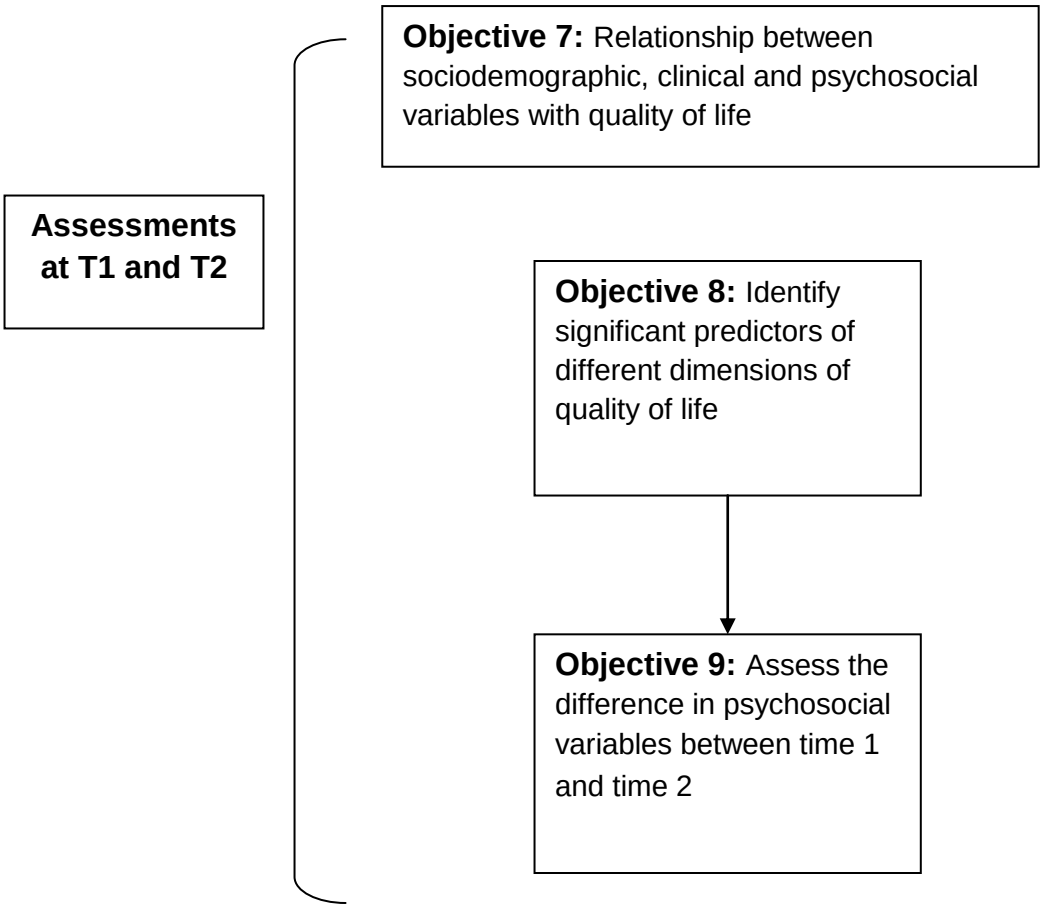


Figure 4-1: Graphical presentation of Results

5 Results

5.1 Introduction

The study was designed to explore psychosocial predictors such as Type D personality, anxiety, depression, and social support in patients following a myocardial infarction. The research further explored the influence of these psychosocial predictors on quality of life of these patients.

This chapter describes the results of this study. The first section of the results presents the sociodemographic characteristics of the actual participants who were recruited and participated in the research. A brief description of the participants who refused to participate and their reasons for refusal are also presented in the initial section of the results (table 5.1).

The assessment was done in 2 stages, initially at baseline (time1) within two to eight weeks of diagnosis of MI. The second assessment was done after 9 months at follow up (time 2). The descriptive results from each stage of the study are presented sequentially. Sociodemographic characteristics of those participants who participated at time 2 assessment and those who were not able to participate are also reported in the sociodemographic section.

The descriptive analysis of time1/time2 in terms of Type D personality, levels of anxiety and depression are presented together. Gender differences in terms of Type D personality, level of anxiety and depression are also presented in this

section of descriptive analyses. The result of each analysis is presented sequentially (time1/time 2) within each subsection the results. The differences between time 1 and time 2 are presented in the final section.

The results are presented in the form of tables. The description for each table is presented before the table in the text. The specific statistical tests used are described in the methods chapter and at relevant points below.

Table 5-1: Description of MI patients that refused to take part in the study during baseline assessment

Number of participants	***Gender***	***Age range***	***Reason for refusal***
16	Female	35-60 years	Reason not provided
6	Male	30-68	Reason not provided
3	Male	45-60	Left in the middle of assessment and provided no reason
3	Male	45-55	Difficulty in comprehension of Urdu language
4	Female	40-65	Difficulty in comprehension of Urdu language
2	Males	47-50	Took research information home however never responded back
2	Female	40-50	Took research information home however never responded back

5.2 Baseline Characteristics of Participants (Time 1)

5.2.1 ***Sociodemographic characteristics of participants (time 1)***

The sociodemographic data and distribution of three hundred participants (table 5. 2) indicated that the sample consisted of hundred and fifty six (n=156/300; 52.0%) males and hundred and forty four (n=144/300; 48.0%) females. Mean

age of the participants was 50.7 (SD =12.3) years ranging from 25 to 80 years. Mean age of female participants was 50.4(SD=12.6) and mean age of male participants was 51.0(SD=12.0).There was no significant difference in the mean age of male and female participants at time 1.

Two hundred and thirty two participants (n=232/300; 77.3%) were married while seventeen (n=17/300; 5.7%) were unmarried, six (n=6/300; 2.0%) were divorced and forty five (n=45/300; 15.0 %) were widow/widower. As for level of education, twenty one participants (n=21/300; 7.0%) had no educational qualification and seventy four (n=74/300; 24.7%) were educated up to primary level (5th grade)[1].However forty eight participants (n=48/300; 16.0 %) had completed postgraduate education and seventy five (n=75/300; 25.0%) completed 12th (intermediate) grade. In the total sample of 300 participants the educational qualification of 65% participants (195/300; 65%) ranged between 5th to 12thgrades.

Regarding occupation, hundred and two female participants (n=102/300; 34.0%) were housewives while eighty seven (n=87/300; 29.0%) participants were employed on full time and sixty three (n=63 /300; 21.0%) were employed on part time basis. Forty six participants (n=46/300; 15.3%) reported less than 20 thousands rupees family monthly income while twenty seven participants (n=27/300; 9.0%) reported more than 70 thousands rupees per month family income. Majority of the participants (n=193/300; 64.3%) belonged to a joint family system[3] while 107(n=107/300; 35.7%) belonged to a nuclear family.

[1]Similar to British education system

Table 5-2 gives the descriptive analysis of sociodemographic characteristics of the participants at baseline within 2-8 weeks of diagnosis of MI.

Table 5-2: Sociodemographic characteristics of participants at baseline (N=300)

Variables	***Mean (M)***	***Standard deviation(SD)***	***Frequency (f)***	***Percentage (%)***
Age (Years)	50.7	12.3	--	--
Sex				
Males	--	--	156	52.0
Females	--	--	144	48.0
Marital Status				
Married	--	--	232	77.3
Unmarried	--	--	17	5.7
Widow/ Widower	--	--	45	15.0
Divorced	--	--	6	2.0
Education				
No educational qualification	--	--	21	7.0
Primary (5^{th} grade)	--	--	74	24.7
Secondary(10^{th}grade)	--	--	46	15.3
Intermediate (12^{th} grade)	--	--	75	25.0
Bachelor	--	--	36	12.0
Postgraduate[2]	--	--	48	16.0

[2]Postgraduate – includes people with masters, PhD and professional education

[3]Joint family system is defined as "comprising of number of patrilinially related nuclear families living under same roof, sharing immovable property (Orenstein, 1961, p. 341)

Variables	*Mean (M)*	*Standard Deviation (SD)*	*Frequency (f)*	*Percentage (%)*
Occupation				
Housewife	--	--	102	34.0
Employed (Full time) [4]	--	--	87	29.0
Employed (part time) [5]	--	--	63	21.0
Self-employed[6]	--	--	22	7.3
Unemployed/Retired	--	--	26	8.7
Family Monthly Income (Rupees)				
Below 20,000[7]	--	--	46	15.3
21,000-30,000[8]	--	--	55	18.3
31,000-40,000	--	--	58	19.3
41,000-50,000	--	--	42	14.0
51,000-60,000	--	--	40	13.3
61,000-70,000[9]	--	--	32	10.7
71,000 and Above	--	--	27	9.0
Family system				
Nuclear	--	--	107	35.7
Joint[3]	--	--	193	64.3

[4]Employed full time – includes people n full time jobs in different institutions and organizations.

[5]Employed (part time) - includes people were on part time in different organizations

[6]Self employed- includes people having their own business

[7]Rs 20,000 is operationally defined as low income level

[8] Rs 21,000-Rs 60,000 is operationally defined as middle income level

[9] Rs 61,000 and above is operationally defined as high income level

5.2.2 Clinical Characteristics of Participants (Time 1)

As for baseline clinical data, disease severity of MI was based on left ventricular ejection fraction (LVEF). Medical records revealed that hundred and seventy seven (n=177/300; 59.0%) participants had normal LVEF, while sixty eight participants (n=68/300; 22.7%) had mild impairment and fifty five participants (n=55/300; 18.3%) had moderate impairment as assessed by echocardiography. Participants were also asked about their smoking status. Hundred and six participants (n=106/300; 35.3%) were current smokers and thirty (n=30/300;

10.0%) had a previous history of smoking while hundred and sixty four (n=164/300; 54.7%) were non-smokers. Medical records also revealed that fifty six participants (n=56/300; 18.7%) had no comorbid disease prior to the diagnosis of MI. Among the remaining participants, sixty six (n=66/300;22.0%) had hypertension, twenty three (n= 23/300; 7.7%) had diabetes, twenty (n=20/300; 6.7%) had angina and nineteen (n=19/300;6.3%) had respiratory disorders as comorbid diseases. Eighty participants (n=80/300; 26.6%) were suffering from two comorbid diseases such as hypertension & diabetes (n=41/300; 13.7%) hypertension & arthritis (n=22/300; 7.3%) and diabetes & arthritis (n=17/300;5.7%).None of the participants reported more than two comorbid physical diseases. Table 5-3 shows the clinical characteristics of the participants at baseline assessment within 2-8 weeks of diagnosis of MI.

Table 5-3: Clinical characteristics of participants at baseline (N=300)

Variables	***Frequency (f)***	***Percentage (%)***
MI Severity (LVEF)		
Normal LVEF	177	59.0
Mild impairment	68	22.7
Moderate impairment	55	18.3
Smoking status		
Non-smoker	164	54.7
Current Smoker	106	35.3
Previous Smoker	30	10.0

Variables	*Frequency*	*Percentage*
	(f)	*(%)*
Comorbid diseases		
Diabetes Mellitus	23	7.7
Hypertension	66	22.0
Respiratory Disorders	19	6.3
Ulcers or digestive disorders	17	5.7
Diabetes &hypertension	41	13.7
Hypertension & arthritis	22	7.3
Diabetes & arthritis	17	5.7
Angina	20	6.7
Others (Kidney, Liver)	19	6.3

5.3 Characteristics of Participants at 9 months follow up (Time 2)

5.3.1 Sociodemographic characteristics of participants (time 2)

All study questionnaires were administered again at 9 months follow up. The questionnaires were administered in the same sequence as time 1 assessment. The total sample at time 2 assessment consisted of hundred and ninety one participants. There were hundred and four (n=104/191; 54.4%) males and eighty seven (n=87/191; 45.6%) females in the sample. Mean age of the total sample was 50.4(SD=12.3). Mean age of female participants was 51.3(SD=12.6) and male participants was 50.0(SD=12.1).Hundred and forty six participants (n=146/191; 76.4%) were married while thirteen (n=13/191; 6.8%) were unmarried. Thirty participants (n=30/191; 15.7%) were educated up to postgraduate level and thirteen (n=13/191; 6.8%) had no educational

qualification. Fifty nine participants (n=59/191; 30.9%) were employed on full time basis and forty (n=40/191; 20.9%) were employed on part time jobs. In the total sample of 191 participants, seventeen participants (n=17/191; 8.9%) had more than seventy thousands (rupees) monthly income, while twenty nine participants (n=29/191; 15.2%) had monthly income below twenty thousands. Seventy six participants (n=76/191; 39.8%) had nuclear family and hundred and five (n=115/191; 60.2 %) had joint family system.

5.3.2 ***Sociodemographic characteristics of participants at time1 and 2***

Sociodemographic and clinical characteristics of the participants across time 1 and 2 are presented in the tables 5.4 and table 5.5 respectively.

Table 5-4: Sociodemographic characteristics of participants at Time 1 and 2

	Time1		***Time2***	
Variables	***M(SD)***	***f (%)***	***M(SD)***	***f(%)***
Age	50.7(12.3)	-	50.4(12.3)	-
Sex				
Males	--	156(52.0)	--	104(54.4)
Females	--	144(47.0)	--	87(45.6)
Marital Status				
Married	--	232(77.3)	--	146(76.4)
Unmarried	--	17(5.7)	--	13(6.8)
Widow/ Widower	--	45(15.0)	--	30(15.7)
Divorced	--	6(2.0)	--	2(1.0)
Education				
None	--	21(7.0)	--	13(6.8)
Primary (5^{th} grade)	--	74(24.7)	--	46(24.0)
Secondary(10^{th}grade)	--	46(15.3)	--	29(15.1)
Intermediate(A Levels)	--	75(25.0)	--	51(26.7)
Bachelor	--	36(12.0)	--	22(11.5)
Postgraduate	--	48(16.0)	--	30(15.7)

Variables	*Time 1*		*Time 2*	
	M(SD)	*f (%)*	*M(SD)*	*f(%)*
Occupation				
Housewife	--	102(34.0)	--	61(31.9)
Employed (Full time)	--	87(29.0)	--	59(30.9)
Employed (part time)	--	63(21.0)	--	40(20.9)
Self-employed	--	22(7.3)	--	15(7.9)
Retired/Unemployed	--	26(8.7)	--	16(8.4)
Family Monthly Income (Rupees)				
Below 20,000	--	46(15.3)	--	29(15.2)
21,000-30,000	--	55(18.3)	--	35(18.3)
31,000-40,000	--	58(19.3)	--	28(14.7)
41,000-50,000	--	42(14.0)	--	29(15.2)
51,000-60,000	--	40(13.3)	--	32(16.8)
61,000-70,000	--	32(10.7)	--	21(11.0)
71,000 and Above	--	27(9.0)	--	17(8.9)
Family system				
Nuclear	--	107(35.7)	--	76(39.8)
Joint	--	193(64.3)	--	115(60.2)

5.3.3 Clinical characteristics of participants (time 2)

During time 2 assessments at 9 months follow up, information such as readmissions in hospital and mortality was also gathered. Information regarding mortality was taken from the relatives of the deceased.

Analysis of clinical data at time 2 assessment after 9 month follow up revealed that forty seven participants (n=47/191; 24.6%) had mild impairment, twenty nine participants (n=29/191; 15.2%) had moderate and hundred and fifteen (n=115/191; 60.2%) had normal LVEF as assessed during echocardiography.

Seventy nine participants (n=79/191; 41.4 %) were current smokers and ninety seven (n=97/191; 50.8%) were non-smokers. In the total sample of hundred and ninety one participants, thirty seven (n=37/191; 19.4 %) reported no comorbid disease, forty (n=40/191; 20.9 %) reported hypertension as a comorbid disease and twenty two participants (n=22/191; 11.5 %) reported two comorbid diseases i.e diabetes and hypertension. The data for the readmission was gathered from the participants and hospital records. As for the readmissions, nine participants (n=9/191; 4.7 %) reported readmission in hospital. Seven out of nine participants had unplanned readmission due to angina (4 participants), cardiac related complications such as symptomatic arrhythmias (2 participants) and worsening of the disease status (1 participant). Two participants were readmitted for coronary artery bypass grafting surgery (CABG). In the total sample of hundred and ninety one participants only eight (n=8/191; 4.2%) reported life events between time 1 and time 2 assessments. Two participants reported the death of their spouse and three reported deaths in close family members. One participant reported losing a job, while two reported undergoing CABG as significant life event experienced before time 2 assessments. Table 5.5 shows the clinical characteristics of participants at time 1 and time 2 assessments.

Table 5-5: Clinical characteristics of participants at Time 1 and Time 2

Variables	***Time 1***	***Time 2***
	f (%)	***f(%)***
MI Severity (LVEF)		
Normal LVEF	177(59.0)	115(60.2)
Mild impairment	68(22.7)	47(24.6)
Moderate impairment	55(18.3)	29(15.2)
Smoking status		
Non-smoker	164(54.7)	97(50.8)
Current Smoker	106(35.3)	79(41.4)
Previous Smoker	30(10.0)	15(7.9)
Comorbid Physical diseases		
No disease	56(18.7)	37(19.4)
Diabetes Mellitus	23(7.7)	15(7.9)
Hypertension	66(22.0)	40(20.9)
Respiratory Disorders	19(6.3)	12(6.3)
Angina	20(6.7)	13(6.8)
Ulcers& digestive disorders	17(5.7)	11(5.8)
Diabetes &hypertension	41(13.7)	22(11.5)
Hypertension & arthritis	22(7.3)	18(9.4)
Diabetes & arthritis	17(5.7)	11(5.8)
Others (Kidney, Liver etc.)	19(6.3)	12(6.3)
Readmission		
Yes	__	9(4.7)
No	__	182(95.3)
Life events experienced between T1 & T2		
Yes	__	8(4.2)
No	__	183(95.8)

5.4 Comparison of Sociodemographic Characteristics of Participants between Time1 and Time 2

The chi-square goodness-of-fit test was used to determine whether the distribution of participants in all the categorical sociodemographic and clinical variables at time 1 assessment (baseline) is same as at time 2 assessments (9 months follow up) .

A chi-square goodness-of-fit test was conducted to determine whether the participants recruited to the study at time 2 assessments had the same proportion of males and females as those recruited at time 1 assessment. The analysis indicated that statistically there was no significant difference between the proportion of males and females participants recruited at baseline assessment (time 1) and 9 months (time 2) follow up ($\chi 2$ (1) = 0.459, p = 0.498). Chi square analysis also revealed non-significant differences in sociodemographic variables such as marital status ($\chi 2$ (3) = 1.388, p = 0.708) education ($\chi 2$ (5) = 0.308, p = 0.997) occupation ($\chi 2$(4) = 0.967, p = 0.564) and family monthly income ($\chi 2$(6) = 4.049, p = 0.670). Similarly the chi-square goodness-of-fit test indicated non-significant differences in clinical variables such as MI severity ($\chi 2$ (2) = 1.399, p = 0.497), smoking status ($\chi 2$ (2) = 3.371 p = 0.185) and comorbid medical diseases ($\chi 2$ (9) = 1.953 p = 0.992).

Table 5-6 shows distribution of participants according to their socio-demographics at two time levels (baseline & 9 months follow up) in this study. As shown below, the chi square analysis revealed that the sample distribution is not significantly different at time 2 assessment (9 months follow up) as compared to time 1 assessment (baseline).

Table 5-6: Chi square distribution for number of participants who responded only at time1 and those who responded both at time 1and 2

Variables	***Categories***	***Participant responded at time 1&2***	***participants responded at time 1***	X^2	***df***	***p***
		(f)	***(f)***			
Age	Mean age	50.4	50.7			
Sex	Males	104	156	0.459	1	0.498
	Females	87	144			
Marital status	Married	146	232	1.388	3	0.708
	Unmarried	13	17			
	Widow/ Widower	30	45			
	Divorced	2	6			

Variables	*Categories*	*Participant responded at time 1&2*	*Total participants responded at time 1*	X^2	*df*	*p*
		(f)	*(f)*			
Education	Illiterate	13	21			
	Primary (5th grade)	46	74	0.308	5	0.997
	Secondary (10th Grade)	29	46			
	Intermediate (A levels)	51	75			
	Bachelor	22	36			
	Postgraduate	30	48			
Occupation	Housewife	61	102			
	Employed (Full time)	59	87			
	Employed (part time)	40	63	0.967	4	0.564
	Self-employed	15	22			
	Unemployed/Retired	16	26			
Income	Below 20,000	29	46			
	21,000-30,000	35	55			
	31,000-40,000	28	58	4.049	6	0.670
	41,000-50,000	29	42			
	51,000-60,000	32	40			
	61,000-70,000	21	32			
	71,000 and Above	17	27			
Family System	Nuclear	76	107	1.416	1	0.234
	Joint	115	193			

Variables	*Categories*	*Participant responded at time 1&2*	*Total participants responded at time 1*	X^2	*df*	*p*
		(f)	*(f)*			
MI severity (LVEF)	Normal	115	177	1.399	2	0.497
	Mild	47	68			
	Moderate	29	55			
Smoking Status	Non-smoker	97	164	3.371	2	0.185
	Current Smoker	79	106			
	Previous Smoker	15	30			
Comorbid Physical diseases	No disease	56	37	1.953	9	0.992
	Diabetes Mellitus	23	15			
	Hypertension	66	40			
	Respiratory Disorders	19	12			
	Angina	20	13			
	Ulcers& digestive disorders	17	11			
	Diabetes &hypertension	41	22			
	Hypertension & arthritis	22	18			
	Diabetes & arthritis	17	11			
	Others (Kidney, Liver etc.)	19	12			

5.5 Sociodemographic, Clinical & Psychosocial Characteristics of Participants, died before Time 2

5.5.1 Sociodemographic characteristics

A total number of twelve participants died before time 2 assessments at 9 months follow up. Information such as reason for death and date of death was taken from the relatives of the deceased participants. Nine participants died due to second MI, one participant died due kidney failure and two died during coronary artery bypass graft (CABG) surgery. All the twelve participants died within 3 months of first time diagnosis of MI. Analysis revealed that out of twelve patients , seven (n=7/12; 58.3 %) were females and five (n=5/12; 41.7 %) were males with mean age of 49.7(SD=7.3). Seven participants (n=7/12; 58.3 %) were married, three (n=3/12; 25.0 %) were divorced and 2 (n=2/12; 16.7 %) were widow/widower. Six participants (n=6/12; 50.0 %) were housewives, four (n=4/12; 33.3 %) were employed on part time and two (n=2/12; 16.7%) on full time jobs.

Descriptive analysis of sociodemographic variables of participants, who died before time 2 assessments at 9 months follow up, is presented in the table 5-7.

Table 5-7: Sociodemographic characteristics of participants who died before time 2 (N=12)

Variables	*Categories*	*Mean (M)*	*Standard deviation (SD)*	*Frequency (f)*	*Percentage (%)*
Age	Age(years)	49.7	7.3	--	--
Sex					
	Males	--	--	5	41.7
	Females	--	--	7	58.3
Marital status					
	Married	--	--	7	58.3
	Widow/ Widower	--	--	2	16.7
	Divorced	--	--	3	25.0
Education					
	Primary (5^{th} grade)	--	--	4	33.3
	Secondary(10^{th}grade)	--	--	5	41.7
	Intermediate (12^{th} grade)	--	--	2	16.7
	Bachelor	--	--	1	8.3
Occupation					
	Housewife	--	--	6	50.0
	Employed (full time)5	--	--	2	16.7
	Employed (part time)6	--	--	4	33.3

Variables	*Categories*	*Mean (M)*	*Standard deviation (SD)*	*Frequency (f)*	*Percentage (%)*
Family Monthly Income (Rupees)					
	Below 20,000	--	--	4	33.3
	21,000-30,000	--	--	3	25.0
	31,000-40,000	--	--	3	25.0
	41,000-50,000	--	--	2	16.7
Family system	Nuclear	--	--	2	16.7
	Joint	--	--	10	83.3

5.5.2 Clinical Characteristics

The descriptive analysis of the clinical characteristics of the participants revealed that 9 participants (n=9/12; 75.0 %) had moderate and 3 (n=3/12;25.0 %) had mild LVEF impairment. 5 were non-smokers and 7 were current smokers. 6 participants (n=6/12;50.0 %) reported 2 comorbid diseases and 6 (n=6/12;50.0 %) reported 1 comorbid disease.

Table 5-8 presents the descriptive analysis of clinical variables of participants, who died before time 2 assessments at 9 months follow up.

Table 5-8: Clinical characteristics of participants who died before time 2 (N=12)

Variables	*Categories*	*Mean (M)*	*Standard deviation (SD)*	*Frequency (f)*	*Percentage (%)*
MI severity (LVEF)	Mild impairment	--	--	3	25.0
	Moderate impairment	--	--	9	75.0
		--	--		
Smoking Status	Non-smoker	--	--	5	58.3
	Current Smoker	--	--	7	41.7
Comorbid Physical diseases	Diabetes Mellitus	--	--	2	16.7
	Hypertension	--	--	1	8.3
	Angina	--	--	2	16.7
	kidney disorders	--	--	1	8.3
	Diabetes &hypertension	--	--	4	33.3
	Diabetes & arthritis	--	--	2	16.7

5.5.3 ***Psychosocial characteristics***

The analysis of psychosocial variables revealed that all the twelve (n=12/12; 100.0 %) patients were characterized as Type D individuals. Ten participant (n=10/12; 83.3 %) scored on “caseness” (11-21) level of anxiety and all the twelve participants (n=12/12;100.0%) scored on “caseness” level of depression. Similarly the mean (M=69.8; SD=7.0) score of these twelve participants on social support scale was comparatively low as compared to the mean (M=79.1;SD=12.2) scores of total participants (N=300). This indicated that these

patients had low social support. The mean scores on all four domains of quality of life i.e physical (M=15.0; SD=4.3), psychological (M=12.0; SD=2.1), social (M=6.7; SD=2.7) and environmental (M=14.8; SD=4.2) quality of life of these participants were also low as compared to the rest of the participants. This indicated that twelve deceased participants had impaired quality of life at baseline assessment after the diagnosis of MI. When these participants were asked to rate their overall quality of life all the participants (12) reported their quality of life as very poor. Similarly when asked about level of satisfaction with their health ten patients reported that they were very dissatisfied and two replied that they are dissatisfied with their health. Table 5-9 demonstrates psychosocial characteristics of participants who died before time 2 assessment.

Table 5-9: Psychosocial characteristics of participants who died before time 2 (N=12)

Variables	***Categories***	***Mean (M)***	***Standard deviation (SD)***	***Frequency (f)***	***percentage (%)***
Type D personality	Type D	--	--	12	100.0
Anxiety	Borderline (8-10)	--	--	2	16.7
	Caseness (11-21)	--	--	10	83.3
Depression	Caseness (11-21)	--	--	12	100.0
Social support		69.8	7.0	--	**--**
Quality of life	Physical QOL	15.0	4.3	--	**--**
	Psychological QOL	12.0	2.1	--	**--**
	Social QOL	6.7	2.7	--	**--**
	Environmental QOL	14.8	4.2	--	**--**

5.6 Psychosocial Assessments at Time 1 and Time 2

Baseline assessment was conducted after 2-8 weeks of first time diagnosis of MI. A total number of three hundred participants consented and recruited for the study. Psychosocial variables such as Type D personality, anxiety, depression, social support were assessed with distress scale 14 (DS-14), hospital anxiety and depression scale (HADS), and social support scale (SSS). Quality of life was assessed with WHOQOL- BREF scale.

Follow-up was conducted at 9 months following the baseline administration. All the three hundred patients who completed the baseline assessments were contacted and invited to participate in follow-up assessment. A total of hundred and ninety one patients completed the time 2 assessments. The study questionnaires/scales were repeated to assess Type D personality traits, levels of anxiety, depression and social support and to identify the most significant predictors of quality of life at 9 months follow up. The questionnaires/ scales were administered by the researcher/research assistants in a face to face interview replicating the administration at time 1. Details regarding the procedure are described in method's chapter (section 4.18.1).

5.7 Assessment of Type D Personality (time1)

Type D personality was assessed with the translated version of Distressed Scale 14 (DS-14) (Denollet, 2005) in Urdu language (Gul & BahttiAli, 2009). Type D individuals were identified and classified on the basis of a cut off score of ≥ 10 on both the sub scales of DS-14 (i.e. negative affectivity (NA) and social

isolation (SI)).hundred and fifty five participants (n=155/ 300; 51.7%) were identified with Type D personality traits as assessed with DS-14 scale while hundred and forty five participants (n=145/300; 48.3%) were classified as non-Type D individuals. DS-14 sub-scores for the sample of three hundred participants ranged from 6-24 for negative affectivity (NA), 5-25 for social inhibition (SI) and 12-46 for the combined scores of both scales (NA&SI).

5.8 Assessment of Type D Personality (Time2)

At 9 months follow up, Type D personality was again assessed in the same MI patients (n=191). One hundred participants (n=100/191; 52.4%) were identified with Type D personality traits as assessed with DS-14 scale .While ninety one participants (n=91/191; 47.6%) were classified as non-Type D individuals.

Tables 5-10 depict the Type D personality types in MI patients at baseline after 2-8 weeks (time 1) of MI and 9 months follow up assessments (time 2) based on the scores of DS-14.The following table indicate that there is only slight difference in the percentage of participants identified with Type D personality at time 1(n=155/ 300; 51.7%) and time 2 assessment (n=100/191; 52.4%) assessments. The analysis indicated the stability of Type D personality over 9 months period of time.

Table 5-10: Assessment of Type D personality at time 1(N=300) and time 2 (N=191)

Type of Personality	Time 1 (n = 300)		Time 2 (n = 191)	
	Frequency (f)	Percentages (%)	Frequency (f)	Percentages (%)
Type D	155	51.7	100	52.4
Non-Type D	145	48.3	91	47.6

5.9 Assessment of Anxiety and Depression (Time1)

Anxiety and depression was assessed with the Hospital Anxiety and Depression scale (HADS) at baseline after 2 -8 weeks of diagnosis of MI and 9 months follow up. The validated and translated version (Mumford et al., 1991) of HADS in the Urdu language for Pakistan was used in this research. According to Zigmond & Snaith (1983) scores of 11 or more on either subscale are considered to be significant and constitute a “case” of psychological morbidity. In contrast, scores of 8–10 represents “borderline” and 0–7 “normal” psychological functioning. The same cut off scores were used in the adapted version of HADS (Mumford et al., 1991). Individuals were classified as “normal” if they scored from0 to 7, “borderline” if their scores ranged from 8 to10 and scores from scores from 11 to 21 indicated “caseness”.

In this study, hundred and twenty seven participants (n=127/ 300; 42.3%) scored at “normal level” (0-7); forty six (n=46/300; 15.4 %) at “borderline” (8-10) and 127 participants (127/300; 42.3%) scored at “caseness” level (11-21) of anxiety. The range of scores on the anxiety subscale for the total sample of three hundred ranged from 4 to21.

The descriptive analysis of levels of depression based on the scores of HADS revealed that hundred and twenty three participants (n=123/ 300; 41.0%) scored between 0 and 7 indicating “normal” psychological functioning. However thirty eight participants (n=38/300; 12.7%) were at the “borderline” level (8-10) and hundred and thirty nine participants (n=139/ 300; 46.3%) scored between 11 and 21 indicating “caseness” for depression. The range of scores on the depression subscale for the total sample (300 participants) ranged from 5 to 20.

5.10 Assessment of Anxiety and Depression (Time2)

Anxiety and depression was again assessed with the Hospital Anxiety and Depression scale (HADS) at 9 months follow up (time2). During time 2 assessment, fifty two participants (n=52/ 191; 26.3%) scored at normal (0-7) level, twenty three (n=23/191; 12.0 %) at borderline (8-10) and hundred and sixteen participants (116/191; 60.7%) scored at ‘caseness’ level (11-21) of anxiety. The score of total sample (191participants) on the subscale of anxiety ranged from 4-21.

As for depression, fifty one participants (n=51/191; 26.7%) scored on the "normal" (0-7) level, thirty (n=30/191; 15.7%) were at the "borderline" (8-10) level and hundred and ten participants (n=110/ 191; 57.6%) scored at "caseness" (11-21) level of depression. The score on subscale of depression for the total sample of hundred and ninety one participants ranged from 4-20.

Table 5-11 shows the levels of anxiety and depression in MI patients at baseline after 2-8 weeks of MI (time 1) and 9 months follow up (time 2) based on the scores of HADS.

Table 5-11: Assessment of anxiety and depression at time 1(N=300) and time 2 (N=191)

Variables	***Time 1 (n = 300)***		***Time 2 (n = 191)***	
	Frequency (f)	***Percentages (%)***	***Frequency (f)***	***Percentages (%)***
Levels of Anxiety				
Normal (0-7)	127	42.3	52	27.3
Borderline (8-10)	46	15.4	23	12.0
Caseness (11-21)	127	42.3	116	60.7
Levels of Depression				
Normal (0-7)	123	41.0	51	26.7
Borderline (8-10)	38	12.7	30	15.7
Caseness (11-21)	139	46.3	110	57.6

The following section presents the levels of anxiety and depression in Type D and non-Type D participants.

5.11 Anxiety & Depression in Type D and non-Type D Participants (time 1 & time 2)

5.11.1 ***Levels of anxiety in Type D and non-Type D participants (time 1 & time 2)***

The analysis of levels of anxiety in Type D and non-Type D patients at time 1 assessment revealed that hundred and one participants (n=101/155; 65.2 %) with Type D personality traits scored at the “caseness” (11-21) level of anxiety. In non-Type D group only twenty six participants (n=26/145; 17.9 %) scored at “caseness” (11-21) level, ninety seven participants (n=97/145; 66.9 %) scored at “normal” (0-7) level and twenty two (n=22/145; 15.2 %) at borderline” (8-10) level of anxiety.

During time 2 assessment, eighty two Type D participants (n=82/100; 82.0 %) were at the “caseness” (11-21) level of anxiety and only ten participants (n=10/100; 10.0 %) scored at “normal” (0-7) level of anxiety. In non-Type D group thirty four (n=34/91; 37.4 %) participants scored at “caseness” (11-21) level and forty two (n=42/91; 46.1 %) at “normal” (0-7) level of anxiety. Chi-square analysis revealed that level of anxiety is higher in participants with Type D personality, both at time 1 and time 2 assessments.

Table 5-12 illustrates the levels of anxiety in Type D and non-Type D participants at time 1 and time 2 assessments.

Table 5-12: Levels of anxiety in Type D and non-Type D participants at time 1 (N=300) and time 2(N=191)

Levels of anxiety	***Time 1***		***Time 2***	
	Non- Type D	**Type D**	**Non- Type D**	**Type D**
	n=145	**n=155**	**n=91**	**n=100**
	f(%)	***f(%)***	***f(%)***	***f(%)***
Normal	97(66.9)	30(19.3)	42(46.1)	10(10.0)
Borderline	22(15.2)	24(15.5)	15(16.5)	8(8.0)
Caseness	26(17.9)	101(65.2)	34(37.4)	82(82.0)
Total	145(100.0)	155(100.0)	91(100.0)	100(100.0)

Time 1 ($\chi 2$ (2) = 79.480, *p* = <0.001) Time2 ($\chi 2$ (2) = 41.353, *p* = <0.001)

5.11.2 *Levels of depression in Type D and non-Type D participants (time 1 & time 2)*

Descriptive analysis for levels of depression in Type D and non-Type D participants revealed that depression was higher in participants with Type D personality characteristics. Majority of Type D participants scored at the "caseness" (11-21) level of depression. The results indicated that hundred and

nineteen participants (n=119/155; 76.8 %) with Type D personality scored at caseness" (11-21) level of depression at time 1 and ninety, Type D participants (n=90/100; 90.0 %) scored at caseness" (11-21) level of depression at time 2 assessment.

Table 5-13 shows the levels of depression in Type D and non Type D participants at time one and time 2 assessments.

Table 5-13: Levels of depression in Type D and non-Type D participants at time 1(N=300) and time 2(N=191)

Levels of depression	***Time 1***		***Time 2***	
	Non- Type D n=145 ***f(%)***	**Type D n=155** ***f(%)***	**Non- Type D n=91** ***f(%)***	**Type D n=100** ***f(%)***
Normal	106(73.1)	17(11.0)	49(53.8)	2(2.0)
Borderline	19(13.1)	19(12.2)	22(24.2)	8(8.0)
Caseness	20(13.8)	119(76.8)	20(22.0)	90(90.0)
Total	145(100.0)	155(100.0)	91(100.0)	100(100.0)

Time 1 ($\chi 2$ (2) = 134.726, *p* = <0.001) Time2 ($\chi 2$ (2) = 94.178, *p* = <0.001)

‘

The following section presents the descriptive analysis of the levels of anxiety and depression in male and female participants.

5.12 Gender Differences in Type D personality, Anxiety & Depression (Time 1 & Time 2)

5.12.1 Gender difference in Type D personality

Type D personality characteristics were assessed in males and females participants with DS-14 scale, both at time 1 and time 2. Table 5.11 indicates that during time one, seventy seven male participants (n=77/ 156; 49.4%) and sixty eight female participants (n=68/ 144; 47.2%) were classified as non-Type D, whereas seventy nine male participants (n=79/ 156; 50.6%) and seventy six female participants (n=76/ 144; 52.8%) were classified as Type D individuals. At time 2, fifty male participants (n=50/ 104; 48.1%) and forty one female participants (n=41/ 87; 47.1%) were classified as Type D, whereas fifty four male participants (n=54/ 104; 51.9%) and forty six female participants (n=46/ 87; 52.9%) were classified as Type D. The analysis revealed that the percentage of female participants with Type D personality characteristics was slightly higher compared to males, at time 1 and time 2 assessments.

Table 5-14 shows the descriptive analysis (percentage & frequency) of Type D and non-Type D personality in male and female participants.

Table 5-14: Type D personality in male and female participants at time 1(N=300) and time 2(N=191)

Type D personality	***Time 1***		***Time 2***	
	Male n=156 f(%)	***Female n=144 f(%)***	***Male n=104 f(%)***	***Female n=87 f(%)***
Non-Type D	77(49.4)	68(47.2)	50(48.1)	41(47.1)
Type D	79(50.6)	76(52.8)	54(51.9)	46(52.9)
Total	156(100.0)	144(100.0)	104(100.0)	87(100.0)

5.12.2 ***Gender difference in levels of anxiety***

Table 5-15 shows levels of anxiety in male and female participants as assessed on basis of scores obtained on Hospital anxiety and depression scale (HADS) both at time 1 and time 2. Findings for the male participants showed that during time one, seventy (n=70/ 150; 44.9%) scored at “normal level” (0-7); 22 (n=22/150; 14.1 %) at “borderline” (8-10) and sixty four male participants (64/150; 41.0%) scored at “caseness” level (11-21) of anxiety. Findings for female participants indicated that during time one, fifty seven (n=57/ 144; 39.6%) scored at “normal level” (0-7); twenty four (n=24/14416.7 %) at “borderline” (8-10) and sixty three female participants (63/144; 43.7%) scored at “caseness” level (11-21) of anxiety.

Analysis of anxiety levels in male participants at time 2 indicated that twenty five (n=25/ 104; 24.0%) scored at “normal level” (0-7); thirteen (n=13/104; 12.5 %) at

"borderline" (8-10) and sixty six participants (66/104; 63.5%) scored at "caseness" level (11-21) of anxiety. Findings for female participants at time 2 indicated that twenty seven (n=27/ 87; 31.0%) scored at "normal level" (0-7); ten (n=10/87, 14.5 %) at "borderline" (8-10) and fifty participants (50/87; 57.5%) scored at "caseness" level (11-21) of anxiety. The analysis indicated that at time 1 assessment more females scored at "caseness" level .However at time 2 assessments the level of anxiety increased for male participants and they scored higher as compared to females at "caseness" level of anxiety.

Table 5-15 shows the descriptive analysis of levels of anxiety in male and female participants at time 1 and time 2 assessments.

Table 5-15: Levels of anxiety in male and female participants at time 1(N=300) and time 2(N=191)

Levels of anxiety	***Time 1***		***Time 2***	
	Male n=156 f(%)	***Female n=144 f(%)***	***Male n=104 f(%)***	***Female n=87 f(%)***
Normal	70(44.9)	57(39.6)	25(24.0)	27(31.0)
Borderline	22(14.1)	24(16.7)	13(12.5)	10(14.5)
Caseness	64(41.0)	63(43.7)	66(63.5)	50(57.5)
Total	156(100.0)	144(100.0)	104(100.0)	87(100.0)

Time 1 ($\chi 2$ (1) = 0.947, p = 0.623) Time2 ($\chi 2$ (1) = 1.171, p = 0.557)

5.12.3 ***Gender difference in levels of Depression***

Table 5-16 presents the scores of male and female participants in terms of levels of depression examined at time 1 and time 2 on HADS .Findings showed that sixty seven male participants (n=67/ 156; 42.9%) scored at “normal level” (0-7); twenty (n=20/156; 12.8 %) at “borderline” (8-10) and sixty nine participants (69/156; 44.3%) scored at “caseness” level (11-21) of depression at time 1 assessment. Results also indicated that fifty six female participants (n=56/ 144; 38.4%) scored at “normal level” (0-7); eighteen (n=18/144,12.5%) at “borderline” (8-10) and seventy participants (70/144; 48.6%) scored at “caseness” level (11-21) of depression.

Analysis of depression levels in male participants at time 2 indicated that twenty six (n=26/ 104; 25.0%) scored at “normal level” (0-7); seventeen (n=17/104; 16.3 %) at “borderline” (8-10) and sixty one participants (61/104; 58.7%) scored at “caseness” level (11-21) of depression. Findings for female participants at time 2 indicated that twenty five (n=25/ 87; 28.8%) scored at “normal level” (0-7); thirteen (n=13/87, 14.9 %) at “borderline” (8-10) and forty nine participants (49/87; 56.3%) scored at “caseness” level (11-21) of depression. The analysis indicated level of depression was higher in females at time 1 assessment (baseline after 2-8 weeks of MI). While at time 2 assessment (9 months follow up) depression was higher in male as compared to female participants.

Table 5-16 depicts the levels of depression in male and female participants at time 1 and time 2 assessments.

Table 5-16: Levels of Depression in male and female participants at time 1(N=300) and time 2(N=191)

Levels of depression	Time 1		Time 2	
	Male	**Female**	**Male**	**Female**
	n=156	**n=144**	**n=104**	**n=87**
	n(%)	***n(%)***	***n(%)***	***n(%)***
Normal	67(42.9)	56(38.9)	26(25.0)	25(28.8)
Borderline	20(12.8)	18(12.5)	17(16.3)	13(14.9)
Caseness	69(44.3)	70(48.6)	61(58.7)	49(56.3)
Total	156(100.0)	144(100.0)	104(100.0)	87(100.0)

Time 1 ($\chi 2$ (1) = 0.617, p = 0.734) Time2 ($\chi 2$ (1) = 0.352, p = 0.839)

5.13 Assessment of Overall Quality of Life and Satisfaction with Health (Time 1 & Time 2)

Quality of life was assessed with adapted and translated version (Khan et al., 2003) of WHOQOL-BREF in Urdu language .Besides four subscales (physical, psychological social & environmental QOL) of WHOQOL-BREF, there are 2 questions which were examined separately. Question 1 is related to an

individual's overall perception of quality of life. While, an individual's overall perception of health was measured with question 2. Both the question were asked during time 1(baseline after 2-8 weeks of MI) and time 2(9 months follow up) assessments. The analysis revealed that at time 1 assessment, hundred and twenty nine (n=129/300; 43.0%) participant reported their overall quality of life as very poor. Whereas sixty (n=60/300; 20.0%) reported it as poor and only nine participant were very satisfied with their overall quality of life. At time 2 assessment (9 months follow up) none of the participants rated their quality of life as very good. Hundred and fifteen participants (n=115/191; 60.2 %) reported very poor and twenty two participants (n=22/191; 11.5 %) reported that their overall quality of life is poor.

Similarly when asked about the satisfaction with the level of health, hundred and twenty four participants (n=124/300; 41.3%) reported being very dissatisfied with their level of health and only forty eight participants (n=48/300; 16.0%) replied that they are satisfied with their level of health at time 1 assessment. At time 2 assessment hundred and nine participants (n=109/191; 57.1 %) responded that they are very dissatisfied with their level of health and only twenty one participants (n=21/191; 11.0 %) reported that they are satisfied with their overall health.

Tables 5-17 and 5-18 illustrate the descriptive analysis of participants overall perception of quality of life and satisfaction with their health at time 1 and time 2 assessments.

Table 5-17: Perception about overall quality of life at time 1 and time 2

Responses	***Time 1(N=300) f(%)***	***Time 2(N=191) f(%)***
Very good	9(3.0)	--
Good	46(15.3)	15(7.9)
Neither good nor poor	56(18.7)	39(20.4)
Poor	60(20.0)	22(11.5)
Very poor	129(43.0)	115(60.2)

Table 5-18: Overall satisfaction with the level of health at time 1 and time 2

Responses	***Time 1(N=300) f(%)***	***Time 1(N=191) f(%)***
Very dissatisfied	124(41.3)	109(57.1)
Dissatisfied	64(21.3)	24(12.6)
Neither satisfied nor dissatisfied	56(18.7)	37(19.4)
Satisfied	48(16.0)	21(11.0)
Very satisfied	8(2.7)	---

5.14 Data Screening Procedures (Time 1)

It is essential to explore the nature of data before performing primary analyses which helps in determining the selection of appropriate tests according to the distributional characteristics of the data. Therefore in the present study, data was thoroughly screened for errors, missing values, outliers (values that are well

below and well above the other scores) with the help of SPSS version 20. Descriptive analysis for continuous (Mean, standard deviation) and categorical (Frequencies, percentages) variables was done to assess missing values. No missing values were identified for all variables. Inspection of box plot was carried out to identify the outliers. SPSS defines points as outliers if they extend more than 1.5 box-lengths from the edge of the box. Extreme points are those that extend more than three box-lengths from the edge of the box (appendix 10, fig 1-2 for an example of age). Normality of the data was assessed on the basis of the type of variables.

5.14.1 ***Categorical variables***

The distribution of categorical data was assessed by frequency distribution and percentages. The analysis revealed that the subcategories of sociodemographic variable such as marital status and clinical variable such as comorbid diseases had less than 15 participants in few categories. To meet the assumption of at least 15 subjects per predictors (Steven, 1996, p 72) required for social science research for regression and further data analysis, sub-categories of above-mentioned variables were merged and renamed. In sociodemographic variables the subcategories of marital status were merged and renamed as married (n=232/300; 77.3%) and single (n=68/300; 22.7 %). Single included unmarried, widow/widower & divorced. Similarly for the comorbid diseases, initial categories (table 5-2) were merged into three categories such as no disease (n=56/300; 18.7%), one comorbid disease (n=164/300; 54.7%) and two comorbid diseases

(n=80/300; 26.6%). It is to be noted that nobody reported having more than two comorbid diseases.

5.14.2 ***Continuous Variables***

Normality of continuous data was assessed by employing both numerical and graphical method. Numerical assessment was based on the z scores for skewness and kurtosis. While graphical assessments were based on analysis of normal Q-Q plots & histogram (appendix A, fig 2 for an example of age). Skewness is characterized as the degree of symmetry about the mean and can be indicated by the distribution of scores. This distribution of scores can either be positively or negatively skewed. The degree of the skewness can be described as moderately skewed, strongly skewed and extremely skewed in either direction (positive or negative) depending upon the shape of distribution (Pallant, 2007).Kurtosis is characterized as the degree of flatness and peakedness of the distribution. The data set can have negative or positive kurtosis. Positive kurtosis tends to have sharp peak near the mean and have heavy tails. Whereas negative kurtosis tends to have a flat top near the mean. The skewness and kurtosis accept a statistical significance level of $p<0.01$, which equates to a z-score of ±2.58 (Laerd Statistics, 2013). A higher level was chosen as a sample size (N=300) for current study was greater than 200. The skewness and kurtosis values were used to compute z-score. The data is considered as normally distributed if the z-score is within ±2.58. Z-scores for skewness and kurtosis were computed as follow.

1. Z= skewness/Std. error of skewness
2. Z= kurtosis/Std. error of kurtosis

Skewness and kurtosis values near zero indicate symmetrical and mesokutotic distributions. Research suggests that variables with absolute values of the skewness greater than 3.0 may be considered as “extremely” skewed (Kline, 2005) and, more conservatively, absolute values of the kurtosis index greater than 10 indicate deviation from the normality and greater than 20 is an indication of extreme deviation from the normal distribution. These “rules of thumb” were implemented to assess the distributional properties of the variables in this study (DeCarlo, 1997).

5.15 Distributional Characteristics of Baseline Data (Time1)

The distributional characteristics continuous data at baseline (time 1) are described below. Results of the skewness and kurtosis assessments suggested that a few variables did not have approximately normal distributions (Table 5-19). According to Tabachnick & Fidell (2007) with reasonably large samples, skewness will not make a substantive difference in the analysis. Kurtosis can result in an underestimate of the variance but this risk is also reduced with a large sample size of 200 and more than 200 cases (Tabachnick & Fidell, 2007, p.81).The present study sample for time 1 comprised of three hundred participants therefore shape of the distribution was assessed. Normal Q-Q Plots and histograms were used to graphically analyze the normality of data (appendix 10, fig 1-33). Outliers in the data were assessed with box plots (fig 3 for an example).

Table 5-19 presents the distributional characteristics of continuous data collected at baseline assessment after 2-8 weeks of diagnosis of MI.

Table 5-19: Distributional characteristics of continuous variables (time 1)

	Variables	***N***	***Mean (S.D)***	***Skewness (S.E)***	***z-score***	***Kurtosis (S.E)***	***z-score***	***outliers***
Sociodemographic Variable	Age	300	50.7 (12.3)	0.36(0.14)	2.57	-0.12(0.28)	-0.43	0
Psycho-social Variables	Type D personality	300	24.3 (7.59)	0.53(0.14)	3.76	-0.54(0.28)	-1.92	0
	Anxiety	300	10.13(3.78)	0.30(0.14)	2.17	-1.02(0.28)	-3.64	0
	Depression	300	10.31(3.57)	0.36(0.14)	2.57	-0.80(0.28)	-2.85	0
	Social Support	300	79.14(12.18	0.51(0.14)	3.64	-0.48(0.28)	-1.71	0
	Physical QOL	300	20.65(5.16)	0.07(0.14)	0.50	-0.98(0.28)	-3.50	0
	Psychological QOL	300	18.66(5.15)	0.05(0.14)	0.35	-0.85(0.28)	-3.03	0
	Social QOL	300	8.96(2.97)	0.04(0.14)	0.28	-0.84(0.28)	-3.00	0
	Environmental QOL	300	22.83(6.87)	0.09(0.14)	0.64	-0.71(0.28)	-2.53	0

Table 5-19 illustrates distributional characteristics of data (continuous variables) collected during time 1 assessment. There were no missing data and no significant outliers were identified. The skewness values of age, depression, anxiety, physical QOL, Psychological QOL, social QOL and environmental QOL were within the range of normal distribution (±2.58).

5.16 Data Transformation

It has been recommended that in case if the data are not normally distributed we cannot use any of the parametric tests which assume that the data is normally distributed. However it is possible to normalize the data by transforming it. Besides, it is also reported that people often feel uncomfortable when they transform data because it seems like it artificially improves their results but this is only because they are more comfortable with linear or arithmetic scales. However, researchers have suggested that there is no reason for not using other scales (e.g. logarithms, square roots, reciprocals or angles) where appropriate (Sokal & Rohlf, 1995; p. 411-422).

After the assessment of the distributional characteristics, the data for Type D personality & social support was not normally distributed (table 5-19), therefore it was transformed. The type of the transformation depended on the shape of the distribution of data. In case of moderately, positively skewed data square root transformation was used. Whereas for strongly, positively skewed data "logarithmic" transformation was used. Similarly for moderately, negatively skewed data "reflect and square root" transformation was used and for strongly,

negatively skewed data “reflect and logarithmic” transformation was used (Laerd Statistics, 2013).

In case of skewed distribution for the scores of social support and Type D personality the data was transformed before further analysis. Square root transformation was used for moderately positively skewed data and logarithmic transformation was used for strongly positively skewed data. The scores for Type D personality was transformed with square root transformation because the shape of the distribution was moderately positively skewed (appendix 10, fig 7-9). Similarly square root transformation was initially applied to transform the scores for social support after the visual inspection of the histogram (appendix 10, fig 16-18). However the transformation did not reduce the z scores (2.71) for skewness up to the desired range (±2.58). Therefore logarithmic transformation was used to transform the scores for social support. The kurtosis values (z scores) of variables such as anxiety (3.64), depression (2.85) physical QOL (3.50), psychological QOL (3.03) and social QOL (3.00) were slightly higher than ±2.58.Keeping in view the large sample size and shape of distribution of histogram and Q-Q plots, the assumption of normality would not make a significant difference in analysis. Therefore original (non-transformed) data for these variables was used for further analysis.

Table 5-20 illustrates the skewness and kurtosis values before and after transformations.

Table 5-20: Distributional characteristics of data after transformation (time 1)

Variables	***z- score before transformation***		***z score after Transformation***	
	Skewness	Kurtosis	Skewness	Kurtosis
Social support	3.64	-1.71	1.64	-2.39
Type D personality	3.76	-1.92	1.92	-2.89

Table 5-20 illustrates the skewness and kurtosis values after transformation of scores for social support (logarithmic transformation) and Type D personality (square root transformation). The skewness value for transformed data was within the desired range, however the value of kurtosis (-2.89) for Type D personality was increased. Keeping in view the large sample size and shape of distribution in histogram (appendix 10, fig 37-39) the transformed values of skewness and kurtosis were used for further analysis.

5.17 Data Screening Procedures (Time2)

The data collected at 9 months follow up (time 2 assessments) was again thoroughly screened for errors, missing values, and outliers (values that are well below and well above the other scores) with the help of SPSS version 20. Descriptive analysis for continuous (mean, standard deviation) and categorical (frequencies, percentage) variables was done. No missing values were identified for all variables. Inspection of box plot was carried out to identify the outliers (appendix 10, fig 34-60).The distributional characteristics of the data were explored before the further analysis as it is mandatory for the selection of appropriate tests.

5.17.1 ***Categorical variables***

The distribution of categorical data was assessed by frequency distribution and percentages. The subcategories of Sociodemographic variable such as marital status were merged again in to 2 categories i.e. married (n=146/191; 76.4%), and single (n=45/191; 23.6 %) (unmarried, widow/widower & divorced). Clinical variable such as comorbid diseases were also merged into 3 categories i.e. no disease (n=37/191; 19.4%), one comorbid disease (n=103/191; 53.9%) and two comorbid diseases (n=56/191; 26.7%).

5.17.2 ***Continuous Variables***

Normality of continuous data was assessed by employing both numerical and graphical method. The skewness and kurtosis values were used to compute z-score. The skewness and kurtosis accept a statistical significance level of 0 .01, which equates to a z-score of ±2.58 (Laerd Statistics, 2013). The same value was used at time 2 assessment. Data is considered as normally distributed if the z-score is within ±2.58.

The following section describes the distributional characteristics of data at 9 month follow up (time 2). Results of the skewness and kurtosis assessments suggested that all the psychosocial variables have approximately normal distributions. Normal Q-Q Plots and histograms were used to graphically analyze the normality of data. Outliers in the data were assessed with box-plots (appendix 10, fig 34-60).

Table 5-21: Distributional characteristics of continuous variables (time 2)

	Variables	*N*	*Mean (S.D)*	*Skewness (S.E)*	*z-score*	*Kurtosis (S.E)*	*z-score*	*outliers*
Sociodemographic Variable	Age	191	50.39 (12.30)	0.40(0.18)	2.22	-0.05(0.35)	1.42	0
Psycho-social Variables	Type D personality	191	26.20(8.43)	0.35(0.18	1.94	-0.85(0.35)	2.42	0
	Anxiety	191	11.85(4.36)	0.002(0.18	0.01	-0.90(0.35)	2.57	0
	Depression	191	11.60(4.24)	0.17(0.18)	0.94	-0.86(0.35)	2.45	0
	Social Support	191	76.32(15.18	0.01(0.18)	0.05	-0.76(0.35)	2.17	0
	Physical QOL	191	18.41(7.05)	0.20(0.18)	1.11	-0.91(0.35)	2.60	0
	Psychological QOL	191	17.59(6.58)	0.07(0.18)	0.39	-0.89(0.35)	2.54	0
	Social QOL	191	8.89(3.34)	0.05(0.18)	0.28	-0.90(0.35)	2.57	0
	Environmental QOL	191	19.86(8.10)	0.32(0.18)	1.78	-0.89(0.35)	2.54	0

Table 5-21 illustrates distributional characteristics of data (continuous variables) collected during 9 months (time 2 assessment) follow up. There was no missing data and no significant outliers were identified. The skewness and kurtosis values of the variables found to be appropriate to indicate normal distribution. Therefore no transformation was required for further analysis.

5.18 **Relationship between Psychosocial Variables at Time 1 & Time2**

In this section the correlation analysis is presented sequentially for time 1 and time 2 assessments. Correlations were calculated between predictors and outcome variables both at baseline (time 1) and 9 months follow up (time 2). This was done in order to investigate the relationships between each of the predictor and outcome variables at time 1 and time 2. Correlation is a bivariate measure of association (strength) of the relationship between two variables. A correlation of 0 indicates no relationship, whereas a correlation of -1.0 indicates perfect negative correlation and 1.0 indicates perfect positive correlation. The magnitude of the Pearson correlation coefficient determines the strength of the relationship. Cohen(1988, pp79-81)provided following guidelines for determining the strength of association. However there are no hard and fast rules for relating the strength of association to a particular value (Laerd statistics, 2013).

Coefficient Value	**Strength of association**
0.1 < | *r* | <0.3(r=0.01 to 0.29)	Small correlation
0.3 < | *r* | <0 .5(r=0.03 to 0 .49)	Medium correlation
| *r* | >0.5 (r=0.50 to 1.00)	Large correlation

The correlation tests used to measure the relationship between predictors and outcome variable were based on the measurement type of the variables used in this research. Pearson's correlation was used for continuous variables such as age, Type D personality, anxiety, depression, social support and quality of Life (physical, psychological, social, & environmental). Spearman Rho was used to compute the correlation between ordinal variables (education, family monthly income, MI severity& comorbid diseases) and continuous variables (physical QOL, psychological QOL, social QOL, & environmental QOL). Point bi-serial correlation was used for dichotomous (sex, family system & marital status) and poly-serial correlation was used between variables having polychotomous data (occupation, &smoking status) and continuous data (physical QOL, psychological QOL, social QOL & environmental QOL). Necessary assumptions for Pearson's correlation and Spearman's correlation were assessed in order to run the test and have valid results at time 1 & time 2 assessments.

Table 5-22 gives the details about the type of variables and correlations (tests) used to assess the relationship between independent and dependent variables.

Table 5-22: Variables, measurement type and correlations used for association

Variables		*Measurement type*	*Correlations*
Independent	*dependent*		
Age	quality of life(physical, psychological, social & environmental)	Both continuous	Pearson's correlation
Sex	quality of life(physical, psychological, social & environmental)	Dichotomousvs continuous	Point biserial correlation
Marital status	quality of life(physical, psychological, social & environmental)	Dichotomousvs continuous	Pointbiserial correlation
Education	quality of life(physical, psychological, social & environmental)	Ordinal vs continuous	Spearman's correlation
Occupation	quality of life(physical, psychological, social & environmental)	Nominal vs continuous	Poly-serial correlation
family monthly income	quality of life(physical, psychological, social & environmental)	Ordinal vs continuous	Spearman's correlation
family system	quality of life(physical, psychological, social & environmental)	Nominal vs continuous	Pointbiserial correlation
MI severity	quality of life(physical, psychological, social & environmental)	Ordinal vs continuous	Spearman's correlation
smoking status	quality of life(physical, psychological, social & environmental)	Nominal vs continuous	Poly-serial correlation
Comorbid medical diseases	quality of life(physical, psychological, social & environmental)	Ordinal vs continuous	Spearman’s correlation
Type D personality	quality of life(physical, psychological, social & environmental)	Both continuous	Pearson's correlation
Anxiety	quality of life(physical, psychological, social & environmental)	Both continuous	Pearson's correlation
Depression	quality of life(physical, psychological, social & environmental)	Both continuous	Pearson's correlation
Social support	quality of life(physical, psychological, social &environmental)	Both continuous	Pearson's correlation

5.19 Correlation Analysis (Time 1)

The following section on correlation analysis identified which predictors were significantly associated with outcome variable (quality of life) at baseline after 2-8 weeks of diagnosis of MI. Three separate correlation matrices are presented in three tables for time 1 assessments.

5.19.1 ***Correlation between sociodemographic and outcome variables***

Correlation analysis was run to assess the relationship between sociodemographic variables and quality of life (physical, psychological, social, and environmental). The type of correlation approach selected was based on data measurement type (table 5-22).

Table 5-23 illustrates the correlation between sociodemographic variables and outcome variables. Preliminary analysis showed linear relationship between the variables, the variables were normally distributed and there were no outliers. The analysis revealed education was significantly associated at 0.01 level with physical ($r\ (298) = 0.22, p < 0.001$), psychological($r\ (298) = 0.19, p = 0.001$), social ($r\ (298) = 0.17, p = 0.003$) and environmental quality of life ($r(298) = 0.15, p < 0.008$). Family monthly income also had significant relationship with all the domains, such a physical($r(298) = 0.26, p < 0.001$), psychological($r(298) = 0.33, p < 0.001$), social ($r(298) = 0.32, p < 0.001$) and environmental ($r(298) = 0.19, p = 0.001$) quality of life. Marital status had significant relationship with physical($r\ (298) = -0.24, p < 0.001$), psychological($r\ (298) = -0.14, p = 0.013$), and social ($r\ (298) = -0.18, p = 0.002$) quality of life.

Table 5-23: Correlation between sociodemographic variables and quality of life at time 1 (N=300)

	Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
		r(p)	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*
1	**Age**	_									
2	**Sex**		_								
3	**Marital Status**			_				-			
4	**Education**				_						
5	**Occupation**					_					
6	**Family Monthly Income**						_				
7	**Family System**							_			
8	**Physical QOL**	-0.06 (0.275)	-0.07(0.203)	-0.24** (0.001)	0.22**(<0.001)	0.04(0.535	0.26**(<0.001)	-0.03(0.627)	_		
9	**Psychological QOL**	-0.03 (0.580)	-0.06(0.272)	-0.14**(0.013)	0.19**(0.001)	0.08(0.182	0.33**(<0.001)	-0.00(0.956)	0.52**(<0.001)	_	
10	**Social QOL**	-0.05 (0.409)	-0.06(0.328)	-0.18**(0.002)	0.17**(0.003)	0.03(0.663	0.32**(<0.001)	-0.01(0.895)	0.49**(<0.001)	0.58** (<0.001)	_
11	**Environmental QOL**	-0.01 (0.822)	-0.08(0.181)	-0.10(0.074)	0.15**(0.008)	0.04(0.482	0.19**(0.001)	-0.07<0.001)	0.65**(<0.001)	0.56** (<0.001)	0.49** 0.001)

***r*=correlation; QOL= Quality of Life; ** Correlation is significant at p<0.01(sig 2-tailed)* Correlation is significant at p<0.05(sig 2-tailed)**

5.19.2 ***Correlation between medical and outcome variables***

Correlations were computed to assess the relationship between medical variables (MI severity, smoking status & comorbid diseases) and quality of life (physical, psychological, social & environmental QOL). The type of correlation tests was selected on the basis of data type (table 5-24). Table 5-26 illustrates correlation between clinical variables and outcome variables. MI disease severity was found to be significantly associated at <0.01 level with physical($r(298) = -0.44$, $p < 0.001$), psychological($r(298) = -0.48$, $p < 0.001$), social($r(298) = -0.44$, $p < 0.001$) and environmental ($r(298) = -0.44$, $p < 0.001$)quality of life. Among other variables, smoking status had significant correlation with social ($r(298) = -0.12$, $p = 0.038$) quality of life at <0.05 level. Comorbid physical diseases was found to be significantly associated with physical($r(298) = 0.20$, $p = 0.001$) social($r(298) = 0.17$, $p = 0.003$) and environmental($r(298) = 0.16$, $p = 0.006$) quality of life.

Table 5-24: Correlation between clinical variables and quality of life (N=300)

	Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*
		r(p)	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*
1	**MI severity**	_						
2	**Smoking Status**		_					
3	**Comorbid Physical diseases**			_				
4	**Physical QOL**	-0.44**(<0.001)	-0.10(0.079)	-0.20**(0.001)	_			
5	**Psychological QOL**	-0.48**(<0.001)	-0.08(0.177)	-0.06 (0.294)	0.52**(<0.001)	_		
6	**Social QOL**	-0.44**(<0.001)	-0.12* (0.038)	-0.17**(0.003)	0.49**(<0.001)	0.58**(<0.001)	---	
7	**Environmental QOL**	-0.44**(<0.001)	-0.09(0.113)	-0.16**(0.006)	0.65**(<0.001)	0.56**(<0.001)	0.49**(<0.001)	---

***r*=correlation; QOL= Quality of Life; ** Correlation is significant at p<0.01(sig 2-tailed); * Correlation is significant at p<0.05(sig 2-tailed)**

5.19.3 ***Correlation between psychosocial and outcome variables***

A Pearson's product moment correlation was run to assess the relationship between continuous variables such as age , Type D personality , anxiety, depression , social support and domains (physical, psychological, social, environmental) of quality of life. Necessary assumptions for Pearson's correlation were assessed in order to run the test and have valid results. In order to meet the assumption for Pearson correlation, histograms, Q-Q plots and boxplots (appendix 10, fig1-33) were created to identify the shape of distribution and significant outliers. Variables such as social support and Type D personality with non-normal distribution were transformed (table 5-20) and transformed values of these variables were used for further analysis.

Table 5-25 illustrates correlation between psychosocial variables and outcome variables. There was significant negative correlation between Type D personality and physical($r(298) = -0.54, p < 0.001$), psychological($r(298) = -0.62, p < 0.001$), social ($r(298) = -0.70, p < 0.001$) and environmental ($r(298) = -0.57, p < 0.001$) quality of life. There was a significant negative correlation between anxiety and all the domains of quality of life with the highest correlation being between anxiety and psychological ($r(298) = -0.55, p < 0.001$) quality of life. Similarly depression was found to be negatively associated with physical($r(298) = -0.50, p<0.001$), psychological($r(298) = -0.70, p < 0.001$), social($r(298) = -0.60, p < 0.001$) and environmental($r(298) = -0.57, p < 0.001$) quality of life at 0.01 significance level. This indicated that quality of life of MI patients with higher level of depression would be more impaired. Social support was found to

be positively associated with physical(r (298) = 0.71, p < 0.001), psychological(r (298) = 0.50, p < 0.001), social(r (298) = 0.49, p < 0.001) and environmental(r (298) = 0.63, p < 0.01) quality of life at p<0.01.

Table 5-25: Correlation between psychosocial variables and quality of life (N=300)

	Variables	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
		r(p)	***r(p)***	***r(p)***	***r(p)***	***r(p)***	***r(p)***	***r(p)***	***r(p)***
1	**Type D personality**	–							
2	**Anxiety**	0.44**(<0.001)	–						
3	**Depression**	0.68**(<0.001)	0.69**(<0.001)	–					
4	**Social Support**	-0.58**(<0.001)	-0.45**(<0.001)	-0.57**(<0.001)	–				
5	**Physical QOL**	-0.54**(<0.001)	-0.41**(<0.001)	-0.50**(<0.001)	0.71**(<0.001)	–			
6	**Psychological QOL**	-0.62**(<0.001)	-0.55**(<0.001)	-0.70**(<0.001)	0.50**(<0.001)	0.52**(<0.001)	–		
7	**Social QOL**	-0.70**(<0.001)	-0.46**(<0.001)	-0.60**(<0.001)	0.49**(<0.001)	0.49**(<0.001)	0.58**(<0.001)	–	
8	**Environmental QOL**	-0.57**(<0.001)	-0.50**(<0.001)	-0.57**(<0.001)	0.63**(<0.001)	0.65**(<0.001)	0.56**(<0.001)	0.49**(<0.001)	–

***r*=correlation; QOL= Quality of Life ;,** Correlation is significant at p<0.01(sig 2-tailed);* Correlation is significant at p<0.05(sig 2-tailed)**

5.20 Correlation Analysis (Time 2)

Correlations were again calculated between predictors and outcome variables at 9 months follow up. This was done in order to investigate the association between each of the predictor and outcome variables. The correlation tests selected to assess the relationship between predictors and outcome variable were based on the type of the variables (nominal. ordinal, continuous, dichotomous). In the following section three correlation matrices between sociodemographic and outcome variable (quality of life), clinical and outcome variable and psychosocial and outcome variable is presented below in three separate tables.

5.20.1 ***Correlation between sociodemographic and outcome variables***

Correlation analysis was run to assess the relationship between sociodemographic variables and quality of life (physical, psychological, social, and environmental QOL). The type of correlation was selected on the basis of data type (table 5-24).Table 5-28 illustrates the correlation between sociodemographic variables and outcome variables at time 2. The analysis revealed age, sex, education, family system, occupation and marital status were not significantly associated with physical, psychological, social and environmental quality of life at time 2 assessments . Significant relationship was only found between family monthly income and all the domains of quality of life at 0.01 level. Table 5-26 shows that family monthly income had significant relationship with all the domains, such as physical($r\ (189) = 0.20, p < 0.005$), psychological($r\ (189) = 0.24, p = 0.001$), social ($r\ (189) = 0.24, p = 0.001$) and

environmental *(r (189)* = 0.17, *p* = 0.020) quality of life. No significant associations were found between other sociodemographic variables and domains of quality of life. Table 5-26 shows the correlation matrices between sociodemographic variables and four domains of quality of life such as physical, psychological, social and environmental QOL at time 2 assessments.

Table 5-26: Correlation between sociodemographic variables and quality of life at time 2 (N=191)

Variables		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
		r(p)	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*
1	**Age**	__									
2	**Sex**		__								
3	**Marital Status**			__							
4	**Education**				__						
5	**Occupation**					__					
6	**Family monthly Income**						__				
7	**Family System**							__			
8	**Physical QOL**	0.07(0.339)	-0.02(0.790)	0.07(0.339)	0.10(0.154	0.09(0.898	0.20**(0.005	0.03(0.790	__		
9	**Psychological QOL**	0.09(0.220)	0.01(0.957)	0.03(0.725)	0.12(0.094	0.01(0.915	0.24**(0.001	0.08(0.790	0.84**(<0.001)	__	
10	**Social QOL**	-0.06(0.378)	0.06(0.421)	-.03(0.683)	0.10(0.163	0.01(0.940	0.24**(0.001	0.01(0.790	0.73**(<0.001)	0.73**(<0.001)	__
11	**Environmental QOL**	-0.04(0.621)	0.05(0.494)	-0.44(0.548)	0.07(0.329	0.04(0.645	0.17**(0.020	0.04(0.790	0.74**(<0.001)	0.71**(<0.001)	0.66** (<0.001)

***r*=correlation; QOL= Quality of life;** Correlation is significant at p<0.01(sig 2-tailed);* Correlation is significant at p<0.05(sig 2-tailed)**

5.20.2 ***Correlation between clinical and outcome variables***

Correlation analysis was computed to assess the relationship between clinical variables (MI severity, smoking status & comorbid diseases,) and quality of life (physical, psychological, social, & environmental QOL). Table 5-27 illustrates correlation between clinical variables and outcome variables. Analysis revealed that MI disease severity had significant negative association with physical*(r(189)* = -0.44, *p* < 0.001), psychological*(r)(189)* = -0.45, *p* < 0.001), social*(r(189)* = -0.35, *p* < 0.001) and environmental *(r(189)* = -0.45, *p* < 0.001)quality of life. This results indicated higher would be the severity level of MI, more impaired would be the quality of life and vice versa. Smoking status was found to be significantly associated with physical (*r (189)* = -0.15, *p* = 0.036), social (*r (189)* = -0.23, *p* = 0.001), and environmental quality of life(*r (189)* = -0.22, *p* 0.002).However the relationship between smoking status and psychological QOL(*r (189)* = -0.11, *p* = 0.144) was not significant. No significant association was found between comorbid physical diseases and any domain (physical, psychological, social and environmental) of the quality of life at 9 months follow up.

Table 5-27 presents the correlation analysis between medical variables and quality of life at time 2 assessment.

Table 5-27: Correlation between clinical variables and quality of life at time 2 (N=191)

	Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*
		r(p)	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*
1	**MI severity**	_						
2	**Smoking Status**		_					
3	**Comorbid Physical diseases**			_				
4	**Physical QOL**	-0.44**(<0.001)	-0.15*(0.036)	-0.12(0.122)	_			
5	**Psychological QOL**	-0.45**(<0.001)	-0.11(0.144)	-0.19(0.105)	0.84**(<0.001)	_		
6	**Social QOL**	-0.35**(<0.001)	-0.23**(0.001)	-0.10(0.147)	0.73**(<0.001)	0.73**(<0.001)	_	
7	**Environmental QOL**	-0.45**(<0.001)	-0.22**(0.002)	-0.09(0.235)	0.74**(<0.001)	0.71**(<0.001)	0.66**(<0.001)	_

***r*=correlation; QOL= Quality of Life;** ** Correlation is significant at p<0.01(sig 2-tailed);* Correlation is significant at p<0.05(sig 2-tailed)**

5.20.3 ***Correlation between psychosocial and outcome variables***

A Pearson's product moment correlation was run to assess the relationship between continuous variables such as age , Type D personality , anxiety, depression , social support and domains (physical, psychological, social, environmental) of quality of life at time 2 assessments (9 months follow up) .

Table 5-28 illustrates correlation between psycho-social variables and outcome variables. The most significant negative and high correlations existed between depression and physical*(r (189)* = -0.81, *p* < 0.001), psychological*(r (189)* = -0.84, *p* < 0.001), social*(r (189)* = -0.77, *p* < 0.001) and environmental*(r (189)* = -0.70, *p* < 0.001) quality of life at p<0.01 level. There was significant negative correlation between Type D personality and physical*(r (189)* = -0.63, *p* < 0.001), psychological*(r (189)* = 0.63, *p* < 0.001), social *(r (189)* = -0.57, *p* < 0.001) and environmental *(r (189)* = -0.62, *p* < 0.001) quality of life. There was a significant correlation between anxiety and all the domains of quality of life. The highest negative correlation exists between anxiety and social *(r (189)* = 0.62, *p* < 0.001), quality of life. Anxiety was also significantly correlated with physical*(r (189)* = -0.57, *p* < 0.001), psychological *(r (189)* = -0.59, *p* < 0.001) and environmental *(r (189)* = -0.59, *p* < 0.001) quality of life at 9 months follow-up (time 2 assessment). Social support was found to be positively associated with physical*(r (189)* = 0.64, *p* < 0.01), psychological*(r (189)* = 0.62, *p* < 0.01), social*(r (189)* = 0.59, *p* < 0.01) and environmental*(r (189)* = 0.69, *p* < 0.01) quality of life indicating higher would be the social support , better would be the quality of life and vice versa.

Table 5-28: Correlation between Psychosocial Variables and Outcome Variables (QOL) for time 2 (N=191)

	Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
		r(p)	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*	*r(p)*
1	**Type-D personality**	_							
2	**Anxiety**	0.42**(<0.001)	_						
3	**Depression**	0.65**(<0.001)	0.60**(<0.001)	_					
4	**Social Support**	-.58**(<0.001)	-.59**(<0.001)	-.63**(<0.001)	_				
5	**Physical QOL**	-.63**(<0.001)	-.57**(<0.001)	-.81**(<0.001)	0.64**(<0.001)	_			
6	**Psychological QOL**	-.63**(<0.001)	-.59**(<0.001)	-.84**(<0.001)	0.62**(<0.001)	0.84**(<0.001)	_		
7	**Social QOL**	-.57**(<0.001)	-.62**(<0.001)	-.77**(<0.001)	0.59**(<0.001)	0.73**(<0.001)	0.73**(<0.001)	_	
8	**Environmental QOL**	-.62**(<0.001)	-.59**(<0.001)	-.70**(<0.001)	0.69**(<0.001)	0.74**(<0.001)	0.71**(<0.001)	0.66**(<0.001)	_

***r*=correlation; QOL= Quality of life ; ** Correlation is significant at p<0.01(sig 2-tailed);*Correlation is significant at p<0.05(sig 2-tailed)**

5.21 **Regression Analysis (Time 1)**

Series of hierarchical multiple regression were used to assess the significant predictors of quality of life within the four domains and to assess the amount of variance explained by each of these predictor variables. The basic assumptions (Tabachnick &Fidell, 2007;Lared, 2013) for hierarchical multiple regression were assessed for time 1 and time 2 analysis. The details about the assumptions for hierarchical multiple regression was given in data analysis section of methods.

5.22 **Regression procedure**

Keeping in view the previous theoretical and research evidence the variables are entered in the regression model in the following order.

Block 1: Sociodemographic variables

Block 2: Clinical variables

Block 3: Type D personality

Block 4: Anxiety, depression, social support

The order by which the variables were entered in the regression model was based on the previous research evidence (Ali, 2011; Williams et al. 2007). According to William et al. (2007) sociodemographic variables were entered at the first step because these are fixed factors and people have no control over them. Clinical variables were entered at the second step to control the effect of these variables and determine the independent effect of psychosocial predictors on outcome. Presence of Type D personality characteristic was entered at the

third step as it was considered a relatively stable trait. All the other variables such as anxiety, depression and social support were entered at the final step.

The following section presents the hierarchical multiple regression analysis to identify the significant predictors of quality of life. The analysis is presented sequentially for time 1 (baseline after 2-8 weeks of MI) and time 2(9 months follow up) assessments.

5.23 Physical Quality of Life (Time 1)

Hierarchical multiple regression analysis was undertaken to determine predictive ability of independent variables on Physical quality of life. The analysis revealed that there was independence of residuals, as assessed by a Durbin-Watson statistic of 1.92. As for multicollinearity, all the Tolerance values were greater than 0.1 (lowest is 0.31), and VIF values were less than 10 (highest is 3.22) so there was no issue of collinearity among the variables (appendix 11, table 1). Three outliers with standardized residuals values more than +3.3 were detected, however keeping in view the sample size (N=300) the outliers were retained in the data set (appendix 11, table 2).

The assumptions of Normality and linearity were checked from residuals scatterplots generated as a part of regression procedure. Visual inspection of shape of scores on histogram supported the assumption of normality (appendix 11, fig X-1). In the normal P-P plots all data points were positioned on a straight diagonal line from bottom left to top right suggesting no major violation of

linearity and normality (appendix 11, fig 2). The scatterplots (appendix 11, fig 4) showed that the residuals were equally spread over the predicted values of the dependent variable, which means that the assumption of homoscedasticity had not been violated.

Table 5.29 presents hierarchical multiple regression analysis of physical quality of life. Sociodemographic variables such as age and sex, occupation, family monthly income, marital status, family system, education were entered first in the regression model. This model was statistically significant F (7, 292) = 6.26; p <0.001 and explained 13.0% of variance in physical quality of life. In the first model marital status (β = -0.21, p<0.001) and family monthly income (β = 0.26, p<0.001) were identified as significant predictors of physical quality of life.

Clinical variables (MI severity, Comorbid medical diseases and smoking status) were entered in step two. After entry of clinical variables at Step 2 the total variance explained by the model as a whole was 27.0 % (F (10, 289) = 10.63; p <0.001). MI disease (higher impairment of LVEF) severity (β = -0.35, p<0.001) was identified as a significant medical predictor, however marital status (β = -0.16, p= 0.005) and family monthly income (β = 0.19, p=0.002) also remained significant predictors of physical quality of life.

Type D personality was entered at step 3. The introduction of Type D personality

(β = -0.38, p< 0.001) explained additional 35.0 % (F (11, 288) = 14.09; p <0 .001) variance in physical quality of life, after controlling for sociodemographic and clinical variables. However marital status (β = -0.13, p=0.014) and MI severity (β = -0.18, p< 0.001) still remained significant predictors of physical quality of life.

All the remaining psychosocial variables such as anxiety, depression and social support were added at the last step which further increased the variance significantly up to 56.0 %(F (14, 285) = 25.44; p <0.001). Anxiety (β = -0.09, p=0.112) and depression (β = 0.04, p=.602) were added at the last step, however both the variables did not contribute significantly to increase in the amount of variance explained. The final model accounted for 56.0 % of the variance in physical quality of life. In the final model, social support (β = 0.55, p<0.001) was identified as most significant predictor, whereas MI severity (β = -0.11, p=0.031), and marital status (β = -0.09, p=0.049) still remained significant predictors of physical quality of life in the final model.

Table 5-29: Hierarchal multiple regression analysis of Physical Quality of Life (n=300)

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.36	0.13	0.13***					<0.001
Age				(0.02)	0.03	(0.04)	(0.59)	0.557
Sex				(0.59)	0.75	(0.06)	(0.78)	0.434
Marital status				(2.57)	0.73	(0.21)	(3.53)	<0.001
Education				0.17	0.26	0.05	0.64	0.523
Occupation				(0.28)	0.30	(0.07)	(0.91)	0.364
family monthly income				0.71	0.18	0.26	3.92	<0.001
family system				0.57	0.61	0.05	0.95	0.343
Model Two	0.52	0.27	0.14***					<0.001
Age				0.01	0.03	0.01	0.20	0.839
Sex				(1.45)	0.76	(0.14)	(1.91)	0.057
Marital status				(1.93)	0.68	(0.16)	(2.85)	0.005
Education				0.04	0.24	0.01	0.18	0.858
Occupation				(0.20)	0.28	(0.05)	(0.71)	0.479

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
family monthly income				0.53	0.17	0.19	3.18	0.002
family system				0.21	0.57	0.02	0.38	0.706
MI severity				(2.31)	0.35	(0.35)	(6.65)	<0.001
smoking status				(1.12)	0.47	(0.15)	(2.38)	0.018
Comorbid medical disease				(0.15)	0.12	(0.07)	(1.26)	0.209
Model Three	0.59	0.35	0.08***					<0.001
Age				(0.01)	0.03	(0.02)	(0.24)	0.801
Sex				(0.91)	0.72	(0.09)	(1.25)	0.211
Marital status				(1.59)	0.64	(0.13)	(2.47)	0.014
Education				(0.07)	0.23	(0.02)	(0.30)	0.765
Occupation				0.05	0.27	0.01	0.19	0.852
family monthly income				0.18	0.17	0.07	1.06	0.291
family system				0.15	0.54	0.01	0.28	0.780
MI severity				(1.19)	0.38	(0.18)	(3.15)	<0.001
smoking status				(0.78)	0.45	(0.10)	(1.75)	0.081
Comorbid medical disease				(0.12)	0.11	(0.06)	(1.13)	0.260
Type D personality				(2.58)	0.43	(0.38)	(5.99)	<0.001
Model Four	0.75	0.56	0.20***					<0.001
Age				0.02	0.02	0.04	0.82	0.411

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Sex				(0.72)	0.60	(0.07)	(1.20)	0.23
Marital status				(1.06)	0.54	(0.09)	(1.98)	0.049
Education				0.01	0.19	<0.001	0.03	0.973
Occupation				(0.10)	0.22	(0.02)	(0.45)	0.654
family monthly income				0.09	0.14	0.03	0.60	0.548
family system				0.06	0.45	0.01	0.12	0.901
MI severity				(0.71)	0.33	(0.11)	(2.16)	0.031
smoking status				(0.50)	0.37	(0.07)	(1.35)	0.178
Comorbid medical disease				(0.05)	0.09	(0.02)	(0.58)	0.564
Type D personality				(0.74)	0.43	(0.11)	(1.73)	0.086
Anxiety				(0.12)	0.08	(0.09)	(1.59)	0.112
Depression				0.05	0.10	0.04	0.52	0.602
Social support				43.44	4.10	0.55	10.61	<0.001

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ;β = Standardized coefficient; SE= Standard Error; t = estimated coefficient

5.24 **Psychological Quality of Life(Time 1)**

Hierarchical multiple regression was performed to investigate the significant predictors of psychological quality of life in MI patients at baseline assessment within 2-8 weeks of the first time diagnosis of MI. Preliminary analyses were conducted to ensure no violation of the assumptions of independence of residuals, linearity, multicollinearity, homoscedasticity and -normality. The value for Durbin Watson statistic was 1.98 which reflected that there was independence of residuals. Analysis for multicollinearity showed all the tolerance values were greater than 0.1 as lowest value was 0.31. Similarly the highest VIF value was 3.22 which was less than 10, so no issue of multicollinearity in this data set was identified (appendix 11, table 3). Only 1 outlier was detected during casewise diagnostics (appendix 11, table 4). The shape of histogram, and the normal P-P plots with all data points closed to a straight diagonal line from bottom left to top right, suggested no major violation of normality (appendix 11, fig 5 & 6). The scatterplots (appendix 11, fig 7 & 8) plotted between studentized residuals against the (unstandardized) predicted values showed that the residuals were equally spread over the predicted values of the dependent variable, and the data points form a horizontal band which means that the assumption of linearity and homoscedasticity had not been violated.

Table 5-30 presents the regression analysis of psychological quality of life. Sociodemographic variables were again entered in first step and these variables accounted for a significant 14.0% ($F (7, 292) = 6.61$; $p < 0.001$) of the variance in

psychological quality of life. In the first model, marital status (β = -0.12, p=0.046) and family monthly income (β = 0.35 p< 0.001) were identified as significant predictors of psychological quality of life. Medical variables were entered in step 2 and increased the variance up to 31.0% (F (10, 289) = 12.78; p< 0.001). MI disease severity (β = - 0.42, p< 0.001) was identified as most significant predictor and family monthly income (β = 0.29, p< 0.001) still remained a significant sociodemographic predictor of psychological quality of life. After entry of Type D personality at step 3 the total variance explained by the model as a whole was 43.0% (F (11, 288) = 19.66; p <0.001). Along with Type D personality (β = -0.47, p<0 .001) Sociodemographic variable such as family monthly income (β = 0.13, p< 0.027) and MI severity (β = -0.21, p< 0.001) remained the significant predictors. In the final model anxiety, depression and social support were entered. The final model accounted for 61.0% (F (14, 285) = 31.45 p< 0.001) of the variance. In the final model, depression (β = -0.55, p< 0.001) was identified as most significant predictor and Type D personality (β = -0.13, p= 0.029) also remained a significant predictors of psychological quality of life.

Table 5-30: Hierarchical multiple regression analysis of Psychological Quality of Life (n=300)

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.37	0.14	0.14***					<0.001
Age				(0.03)	0.03	(0.08)	(1.10)	0.273
Sex				(0.38)	0.74	(0.04)	(0.50)	0.615
Marital status				(1.45)	0.72	(0.12)	(2.01)	0.046
Education				0.00	0.26	0.00	0.02	0.988
Occupation				(0.06)	0.30	(0.02)	(0.21)	0.837
family monthly income				0.96	0.18	0.35	5.38	<0.001
family system				0.76	0.60	0.07	1.27	0.205
Model Two	0.56	0.31	0.17***					<0.001
Age				(0.02)	0.03	(0.05)	(0.78)	0.439
Sex				(1.05)	0.74	(0.10)	(1.43)	0.155
Marital status				(0.86)	0.66	(0.07)	(1.30)	0.193

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Education				(0.15)	0.23	(0.05)	(0.66)	0.513
Occupation				0.02	0.27	0.01	0.08	0.940
family monthly income				0.78	0.16	0.29	4.82	<0.001
family system				0.23	0.55	0.02	0.41	0.681
Mi severity				(2.76)	0.34	(0.42)	(8.18)	<0.001
smoking status				(0.86)	0.46	(0.11)	(1.90)	0.058
Comorbid medical disease				0.07	0.11	0.03	0.62	0.538
Model Three	0.66	0.43	0.12***					<0.001
Age				(0.04)	0.02	(0.08)	(1.45)	0.149
Sex				(0.39)	0.67	(0.04)	(0.58)	0.565
Marital status				(0.44)	0.60	(0.04)	(0.73)	0.469
Education				(0.29)	0.21	(0.09)	(1.36)	0.176
Occupation				0.32	0.25	0.08	1.30	0.195
family monthly income				0.35	0.16	0.13	2.22	0.027
family system				0.15	0.50	0.01	0.30	0.767
Mi severity				(1.39)	0.35	(0.21)	(3.93)	<0.001
smoking status				(0.45)	0.42	(0.06)	(1.09)	0.278

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Comorbid medical disease				0.10	0.10	0.05	0.95	0.345
Type D personality				(3.16)	0.40	(0.47)	(7.85)	<0.001
Model Four								
Age				0.00	0.02	0.00	0.07	0.946
Sex				(0.50)	0.56	(0.05)	(0.88)	0.379
Marital status				(0.35)	0.50	(0.03)	(0.70)	0.482
Education				(0.05)	0.18	(0.01)	(0.25)	0.800
Occupation				0.04	0.21	0.01	0.17	0.863
family monthly income				0.16	0.13	0.06	1.17	0.245
family system				(0.05)	0.42	(0.00)	(0.11)	0.913
Mi severity				(0.47)	0.31	(0.07)	(1.52)	0.130
smoking status				(0.39)	0.35	(0.05)	(1.12)	0.266
Comorbid medical disease				0.15	0.09	0.07	1.70	0.089
Type D personality				(0.89)	0.40	(0.13)	(2.20)	0.029
Anxiety				(0.09)	0.07	(0.07)	(1.33)	0.185
Depression				(0.79)	0.10	(0.55)	(8.25)	<0.001
Social support				2.51	3.84	0.03	0.66	0.513

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ;β = Standardized coefficient ; SE= Standard Error; t = estimated coefficient

5.25 Social Quality of Life (Time 1)

Hierarchical multiple regression was performed to investigate the significant predictors of social quality of life. Preliminary analysis for basic assumptions revealed that the value for Durbin Watson statistic was 2.02, which indicated the independence of residuals. Analysis for multicollinearity showed all the tolerance values were greater than 0.1 as lowest value was 0.31. Similarly the highest VIF value was 3.22 which was less than 10 indicating no issue of multicollinearity in the data set (appendix 11, table 5). Only one outlier was detected during casewise diagnostics (appendix 11, table 6). In the normal P-P plots (appendix 11, fig 10) all data points were positioned close to a straight diagonal line from bottom left to top right suggesting no major violation of normality. Visual inspection of histogram also supported the assumption of normality (appendix 11, fig 9). The scatterplots (appendix 11, fig 11 & 12) showed that the residuals were equally spread over the predicted values of the dependent variable, and the data points form a horizontal band which means that the assumption of linearity and homoscedasticity had not been violated.

Table 5-31 presents the regression analysis of social quality of life. Sociodemographic variables were entered in first step and these variables accounted for a significant 14.0% ($F(7, 292) = 6.67$; $p < 0.001$) of the variance in social quality of life. Among the sociodemographic variables, marital status ($\beta = -0.15$, $p=0.010$) and family monthly income ($\beta = 0.35$, $p<0.001$)) were identified as significant predictors of social quality of life. Medical variables were entered

in step 2 and increased the variance up to 29.0% (F (10, 289) = 11.63 p< 0.001). MI disease severity (β = - 0.36, p< 0.001) and smoking status (β = - 0.16, p= 0.007) was identified as most significant predictor medical predictor. Family monthly income (β = 0.29, p< 0.001) still remained a significant sociodemographic predictor of social quality of life. However sex which was initially not a significant predictor became significant (β = - 0.17, p< 0.019) after inclusion of medical variables. Since MI severity and smoking status was also identified as a significant predictors in this model it was assumed the either one of the group (male or females) smoked or had more impairment in LVEF and sex became a significant predictor due to its association with smoking status or MI disease severity.

Type D personality was introduced in the model at step 3 and the total variance explained by the model as a whole reached up to 53.0% (F (11, 288) = 29.26; p <0.001). Along with Type D personality (β = -0.65, p< 0.001) education which was initially non-significant became a significant (β = -0.14, p= 0.027) predictor. In the final model anxiety, depression and social support were entered. The final model accounted for 55.0% (F (14, 285) = 24.85; p <0.01) of the variance. In the final model, depression (β = -0.09, p=0.187), anxiety (β = -0.10, p= 0.069), and social support (β = 0.04, p=0.474), did not contribute significantly to increase in the variance. However Type D personality (β = -0.55, p< 0.001) remained a significant predictors of social quality of life.

Table 5-31: Hierarchal multiple regression analysis of Social Quality of Life (n=300)

Variables	*R*	R^2	R^2 *Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.37	0.14	0.14***					<0.001
Age				(0.02)	0.02	(0.09)	(1.39)	0.167
Sex				(0.47)	0.43	(0.08)	(1.09)	0.279
Marital status				(1.08)	0.42	(0.15)	(2.60)	0.010
Education				(0.07)	0.15	(0.04)	(0.44)	0.664
Occupation				(0.18)	0.17	(0.08)	(1.04)	0.302
family monthly income				0.56	0.10	0.35	5.43	<0.001
family system				0.42	0.35	0.07	1.22	0.223
Model Two	0.54	0.29	0.15***					<0.001
Age				(0.01)	0.02	(0.04)	(0.57)	0.568
Sex				(1.02)	0.43	(0.17)	(2.36)	0.019
Marital status				(0.71)	0.39	(0.10)	(1.83)	0.068
Education				(0.14)	0.14	(0.08)	(1.01)	0.311
Occupation				(0.13)	0.16	(0.06)	(0.83)	0.409
family monthly income				0.46	0.10	0.29	4.79	<0.001
family system				0.22	0.32	0.04	0.68	0.498

Variables	R	R^2	R^2 Change	B	SE	β	t	Sig(p)
MI severity				(1.37)	0.20	(0.36)	(6.90)	<0.001
smoking status				(0.73)	0.27	(0.16)	(2.73)	0.007
Comorbid medical disease				(0.09)	0.07	(0.07)	(1.34)	0.182
Model Three	0.73	0.53	0.24***					<0.001
Age				(0.02)	0.01	(0.09)	(1.62)	0.106
Sex				(0.48)	0.35	(0.08)	(1.36)	0.174
Marital status				(0.36)	0.32	(0.05)	(1.15)	0.251
Education				(0.25)	0.11	(0.14)	(2.23)	0.027
occupation				0.12	0.13	0.05	0.88	0.382
family monthly income				0.11	0.08	0.07	1.27	0.206
family system				0.16	0.26	0.03	0.59	0.556
Mi severity new recoded				(0.25)	0.19	(0.07)	(1.36)	0.176
smoking status				(0.40)	0.22	(0.09)	(1.80)	0.073
Comorbid medical disease				(0.07)	0.05	(0.05)	(1.23)	0.221
Type D personality				(2.57)	0.21	(0.65)	(12.12)	<0.001
Model Four	0.74	0.55	0.02***					0.004
Age				(0.01)	0.01	(0.06)	(1.12)	0.264
Sex				(0.48)	0.35	(0.08)	(1.37)	0.172
Marital status				(0.35)	0.31	(0.05)	(1.12)	0.264
Education				(0.20)	0.11	(0.11)	(1.76)	0.080
occupation				0.06	0.13	0.03	0.47	0.636
family monthly income				0.07	0.08	0.04	0.85	0.397
family system				0.11	0.26	0.02	0.44	0.663

Variables	*R*	*R^2*	*R^2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
MI severity				(0.10)	0.19	(0.03)	(0.54)	0.591
smoking status				(0.37)	0.22	0.08	(1.70)	0.090
Comorbid medical disease				(0.05)	0.05	(0.04)	(0.95)	0.341
Type D personality				(2.15)	0.25	(0.55)	(8.62)	<0.001
anxiety				(0.08)	0.04	(0.10)	(1.83)	0.069
depression				(0.08)	0.06	(0.09)	(1.32)	0.187
Social support				1.71	2.38	0.04	0.72	0.474

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ; β = Standardized coefficient ;SE= Standard Error t = estimated coefficient

5.26 **Environmental Quality of Life(Time 1)**

As for environmental quality of life, the preliminary analysis for the assessment of necessary assumptions revealed that there was independence of residuals, as measured by a Durbin-Watson statistic of 1.90. As for multicollinearity, all the tolerance values were greater than 0.1 (lowest is 0.31), and VIF values were less than 10 (highest is 3.22) so there was no issue of collinearity among the variables (appendix 11, table 7). No outliers with standardized residuals values more than +3.0 were detected in the data.

The assumptions of Normality and linearity were further checked from residuals scatterplots generated as a part of regression procedure. In the normal P-P plots all data points lie on a straight diagonal line from bottom left to top right suggesting no major violation of linearity and normality (appendix 11, fig 14). The shape of histogram further substantiated the normal distribution of the data (appendix 11, fig 13). The scatterplots (appendix 11, fig 15 &16) showed that the residuals were equally spread over the predicted values of the dependent variable supporting the assumption of homoscedasticity.

Table 5-32 presents the hierarchical multiple regression analysis of environmental quality of life. Sociodemographic variables such as age and sex, occupation, family monthly income, marital status, family system, education were entered first in the regression model. This model was statistically significant (F (7, 292) = 2.37; p = 0.023) and explained 5.0% of variance in environmental quality of life. In the first model only family monthly income (β =

0.18, p= 0.010) was identified as significant predictors of environmental quality of life. Clinical variables (MI severity, smoking status & comorbid medical diseases) were entered in step two. After entry of clinical variables at Step 2 the total variance explained by the model as a whole was 23.0% (F (10, 289) = 8.40; p <0.001). MI disease (higher impairment of LVEF) severity (β = -0.39, p<0.001) and smoking status(β = -0.16, p=0.010) were identified as significant clinical predictors. Moreover sex(β = -0.16, p=0 .032) became a significant predictor presumably due to its association with smoking status, because smoking was higher in males as compared to females.

Type D personality was entered at step 3. The introduction of Type D personality (β = -0.50, p<0.001) increased the variance up to 36.0 % (F (11, 288) = 15.01; p <0 .001) in environmental quality of life, after controlling for sociodemographic and clinical variables. However MI severity (β = -0.17, p=0 .004) still remained significant predictors of environmental quality of life. All the remaining psychosocial variables such as anxiety, depression and social support were added at the last step which further increased the variance significantly up to 52.0 %(F (14, 285) = 22.23; p <0.001). The final model accounted for 52.0 % of the variance in environmental quality of life. In the final model, social support (β = 0.38, p<0 .001) and anxiety (β = -0.17, p= 0.004) were identified as most significant predictor, whereas Type D personality (β = -0.21, p= 0.002), still remained significant predictor of environmental quality of life in the final model. Family monthly income also became significant (β = -0.11, p< 0.044) in the final model.

Table 5-32: Hierarchal multiple regression analysis of Environmental Quality of Life (n=300)

Variables	*R*	*R^2*	*R^2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.23	0.05	0.05**					0.023
Age				(<0.001)	0.04	(<0.001)	(0.06)	0.955
Sex				(1.00)	1.03	(0.07)	(0.96)	0.337
Marital status				(1.12)	1.00	(0.07)	(1.11)	0.267
Education				0.22	0.36	0.05	0.62	0.539
occupation				(0.34)	0.42	(0.06)	(0.82)	0.411
family monthly income				0.65	0.25	0.18	2.60	0.010
family system				(0.33)	0.84	(0.02)	(0.39)	0.697
Model Two	0.48	0.23	0.17***					<0.001
Age				0.03	0.04	0.06	0.85	0.394
Sex				(2.23)	1.03	(0.16)	(2.16)	0.032
Marital status				(0.17)	0.92	(0.01)	(0.18)	0.856
Education				0.04	0.33	0.01	0.13	0.894
occupation				(0.23)	0.38	(0.04)	(0.61)	0.540
family monthly income				0.39	0.23	0.11	1.71	0.088
family system				(0.85)	0.77	(0.06)	(1.10)	0.271
MI severity				(3.39)	0.47	(0.39)	(7.15)	<0.001
smoking status				(1.59)	0.64	(0.16)	(2.50)	0.013
Comorbid medical disease				(0.25)	0.16	(0.09)	(1.55)	0.121

Variables	*R*	R^2	R^2 *Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model Three	0.60	0.36	0.14***					**<0.001**
Age				0.01	0.03	0.02	0.33	0.739
Sex				(1.29)	0.94	(0.10)	(1.37)	0.172
Marital status				0.43	0.84	0.03	0.51	0.609
Education				(0.15)	0.30	(0.04)	(0.50)	0.616
occupation				0.20	0.35	0.04	0.56	0.574
family monthly income				(0.22)	0.22	(0.06)	(1.01)	0.313
family system				(0.96)	0.70	(0.07)	(1.37)	0.171
MI severity				(1.45)	0.49	(0.17)	(2.92)	0.004
smoking status				(1.01)	0.58	(0.10)	(1.73)	0.084
Comorbid medical disease				(0.21)	0.14	(0.07)	(1.44)	0.150
Type D personality				(4.48)	0.56	(0.50)	(7.94)	<0.001
Model Four	0.72	0.52	0.16***					<0.001
Age				0.05	0.03	0.09	1.60	0.110
Sex				(1.11)	0.82	(0.08)	(1.35)	0.180
Marital status				0.90	0.74	0.06	1.22	0.225
Education				0.05	0.26	0.01	0.20	0.841
Occupation				(0.07)	0.31	(0.01)	(0.21)	0.830
family monthly income				(0.39)	0.19	(0.11)	(2.02)	0.044
family system				(1.15)	0.61	(0.08)	(1.88)	0.061
MI severity				(0.66)	0.45	(0.08)	(1.46)	0.144
smoking status				(0.71)	0.51	(0.07)	(1.40)	0.164

Variables	R	R^2	R^2 Change	B	SE	β	t	Sig(p)
Comorbid medical disease				(0.11)	0.13	(0.04)	(0.87)	0.386
Type D personality				(1.89)	0.59	(0.21)	(3.20)	0.002
anxiety				(0.30)	0.10	(0.17)	(2.92)	0.004
depression				(0.17)	0.14	(0.09)	(1.19)	0.237
Social support				39.87	5.62	0.38	7.09	<0.001

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ; β = Standardized coefficient ;SE= Standard Error t = estimated coefficient

5.27 Regression Analysis (Time 2)

5.27.1 Regression Procedure

Series of hierarchical multiple regressions were run to assess the significant predictors of quality of life on four domains (physical, psychological, social & environmental) at 9 months follow up. It further assessed the amount of variance explained by each of these predictor variables. Before the hierarchical multiple regression analysis was performed, the variables were examined for assumptions required for hierarchical multiple regression to provide valid predictions. At time 2 assessment the same procedure which was used in time 1 assessment was followed and keeping in view the previous theoretical and research evidence (Ali, 2011; Williams et al. 2007) the variables are entered in the regression model in the following order.

Block 1: Sociodemographic variables

Block 2: Clinical variables

Block 3: Type D personality

Block 4: Anxiety, depression, social support

5.28 Physical Quality of life (Time 2)

Hierarchical multiple regression analysis was performed again to identify the significant predictors of physical quality of life at 9 months follow up(time 2) . Preliminary analysis to ensure the necessary assumptions revealed that there

was independence of residuals, as assessed by a Durbin-Watson statistic of 1.96. As for multicollinearity, all the Tolerance values were greater than 0.1 (lowest is 0.32), and VIF values were less than 10 (highest is 3.15) so there was no issue of collinearity among the variables (appendix 12, table 1). No outliers with standardized residuals values more than +3.03 were detected.

In order to ensure the normality of the data, the data was screened (table 5.21) and assessed for normality with the values of skewness and kurtosis. The assumptions of normality were further checked from histograms generated as a part of regression procedure (appendix 12, fig 1). In the normal P-P plots all data points were close to straight diagonal line from bottom left to top right signifying no major violation of linearity and normality (appendix 12, fig 2). The scatterplots (appendix 12, fig Y-3 & Y-4) also supported the assumption of homoscedasticity as the residuals were equally spread over the predicted values of the dependent variable.

Table 5-33, presents the hierarchical multiple regression analysis of physical quality of life. Sociodemographic variables such as age and sex, occupation, family monthly income, marital status, family system, education were entered first in the regression model. This model was statistically not significant F (7, 183) = 1.84; p=0.081) and explained only 7.0% of variance in physical quality of life. In the first model only family monthly income (β = 0.26, p< 0.003) was identified as a significant predictor of physical quality of life. Clinical variables (MI severity, comorbid medical diseases and smoking status) were entered in

step two. After entry of clinical variables at Step 2 the total variance explained by the model as a whole was 24.0 % (F (10, 180) = 5.64; p < 0.001). MI disease (higher impairment of LVEF) severity (β = -0.40, p< 0.001) and smoking status (β = -0.15, p= 0.046) were identified as a significant predictors, however family monthly income (β = 0.20, p=0.015) also remained significant predictor of physical quality of life. Type D personality was entered at step 3. The introduction of Type D personality (β = -0.64, p< 0.001) increased the variance up to 49.0 % (F (11, 179) = 15.89; p <0 .001) in physical quality of life, after controlling for sociodemographic and clinical variables. However smoking status (β = -0.14, p=0.032) still remained significant predictor of physical quality of life.

All the remaining psychosocial variables such as anxiety, depression and social support were added at the last step which further increased the variance significantly up to 71.0 %(F (14, 176) = 31.29; p < 0.001). In the final model, depression (β = -0.66, p< 0.001) and social support (β = 0.16, p= 0.011) were identified as most significant predictors of physical quality of life at time 2 assessment.

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Table 5-33: Hierarchal multiple regression analysis of Physical Quality of Life (n=191)

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.26	0.07	0.07					0.081
Age				(0.08)	0.05	(0.13)	(1.47)	0.144
Sex				(0.66)	1.37	(0.05)	(0.48)	0.632
Marital Status				(0.96)	1.27	(0.06)	(0.76)	0.450
Education				(0.16)	0.47	(0.04)	(0.33)	0.739
Occupation				(0.40)	0.56	(0.07)	(0.70)	0.482
Family monthly income				0.99	0.32	0.26	3.05	0.003
Family system				1.11	1.06	0.08	1.04	0.229
Model Two	0.49	0.24	0.17***					<0.001
Sex				(1.76)	1.36	(0.13)	(1.30)	0.196
Marital Status				(0.48)	1.17	(0.03)	(0.41)	0.680
Education				(0.42)	0.43	(0.10)	(0.98)	0.329
Occupation				(0.21)	0.51	(0.04)	(0.41)	0.686
Family monthly income				0.74	0.30	0.20	2.46	0.015

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
MI Severity				(3.79)	0.65	(0.40)	(5.83)	<0.001
Smoking status				(1.71)	0.85	(0.15)	(2.01)	0.046
Comorbid medical disease				(0.18)	0.21	(0.06)	(0.87)	0.348
Model Three	0.70	0.49	0.26***					<0.001
Age				(0.06)	0.04	(0.10)	(1.42)	0.156
Sex				(1.87)	1.11	(0.13)	(1.69)	0.094
Marital Status				(0.58)	0.96	(0.04)	(0.61)	0.543
Education				(0.46)	0.35	(0.11)	(1.32)	0.190
Occupation				0.06	0.42	0.01	0.15	0.884
family monthly income				0.21	0.25	0.06	0.84	0.403
family system				(0.20)	0.83	(0.01)	(0.24)	0.810
MI Severity				(0.55)	0.63	(0.06)	(0.88)	0.381
Smoking status				(1.50)	0.70	(0.14)	(2.16)	0.032
Comorbid medical disease				(0.07)	0.17	(0.02)	(0.42)	0.678
Type D personality				(0.53)	0.06	(0.64)	(9.51)	<0.001
Model Four	0.85	0.71	0.22***					<0.001
Age				0.00	0.03	0.01	0.09	0.924

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
sex				(1.72)	0.85	(0.12)	(2.02)	0.065
Education				0.13	0.27	0.03	0.47	0.634
Occupation				(0.51)	0.32	(0.09)	(1.56)	0.120
Marital Status				(0.22)	0.75	(0.01)	(0.30)	0.759
family monthly income				(0.05)	0.19	(0.01)	(0.26)	0.792
family system				0.26	0.63	0.02	0.40	0.686
Smoking status				(0.98)	0.56	(0.09)	(1.75)	0.086
Comorbid medical disease				(0.01)	0.13	(0.00)	(0.05)	0.960
MI Severity				0.26	0.49	0.03	0.53	0.600
Type D personality				(0.05)	0.06	(0.06)	(0.90)	0.370
Anxiety				(0.05)	0.09	(0.03)	(0.58)	0.503
Depression				(1.10)	0.12	(0.66)	(9.32)	<0.001
Social support				0.07	0.03	0.16	2.59	0.011

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ; β = Standardized coefficient ;SE= Standard Error t = estimated coefficient

5.29 Psychological Quality of Life (Time 1)

Hierarchical multiple regression was performed to investigate the significant predictors of psychological quality of life in MI patients at 9 months follow up (time 2 assessment). Preliminary analyses revealed that the value for Durbin Watson statistic was 1.98 which indicated independence of residuals. Analysis for multicollinearity showed all the tolerance values were greater than 0.1 as lowest value was 0.32. Similarly the highest VIF value was 3.15 ,so there was no issue of multicollinearity in this data set (appendix 12, table 2). Only 1 outlier with standardized residuals values more than +3.03 was detected during casewise diagnostics (appendix 12, table 3). Visual inspection of the shape of histogram and normal P-P plots suggested no major violation of normality (appendix 12, fig 5 & 6). The scatterplots (appendix 12, fig Y-8) plotted between studentized residuals against the (unstandardized) predicted values showed that the residuals were equally spread over the predicted values of the dependent variable, which means that the assumption of linearity and homoscedasticity had not been violated.

Table 5-34 shows the regression analysis of psychological quality of life during time 2 assessments at 9 months follow up. Sociodemographic variables were again entered in first step and these variables accounted for 10.0 % ($F(7, 183) = 2.76$; $p= 0.009$) of the variance in psychological quality of life. In the first model, Age ($\beta = -0.19$, $p<0.037$) and family monthly income ($\beta = 0.32$ $p< 0.001$) were identified as significant predictors of psychological quality of life at time 2.

Clinical variables were entered in step 2 and increased the variance up to 25.0 % (F (10, 180) = 5.92; p< 0.001). MI disease severity (β = - 0.39, p< 0.001) was identified as most significant predictor and family monthly income (β = 0.26, p< 0.001) still remained a significant sociodemographic predictor of psychological quality of life. After entry of Type D personality at step 3 the total variance explained by the model as a whole was 50.0% (F (11, 179) = 16.55; p < 0.001). Type D personality (β = -0.64, p<0 .001) was identified as the most significant predictor after controlling for sociodemographic and clinical variables. However age which was initially a non-significant predictor became significant (β = -0.17, p< 0.016) at this step. In the final model anxiety, depression and social support were entered. The final model accounted for 75.0 % (F (14, 176) = 37.23 p< 0.001) of the variance in psychological quality of life. In the final model, anxiety(β = -0.08, p=0.122) and social support (β = -0.09, p= 0.111) did not contribute significantly , however depression (β = -0.71, p< 0.001) was identified as most significant predictor of psychological quality of life at 9 months follow up (time 2 assessment) .

Table 5-34: Hierarchal multiple regression analysis of Psychological Quality of Life (n=191)

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*T*	*Sig(p)*
Model One	0.31	0.10	0.10***					0.009
Age				(0.10)	0.05	(0.19)	(2.10)	0.037
Sex				(0.53)	1.26	(0.04)	(0.42)	0.676
Marital Status				(0.21)	1.17	(0.01)	(0.18)	0.860
Education				(0.21)	0.43	(0.05)	(0.47)	0.636
Occupation				(0.40)	0.52	(0.08)	(0.77)	0.440
family monthly income				1.11	0.30	0.32	3.73	<0.001
Family system				1.64	0.98	0.12	1.67	0.096
Model Two	0.50	0.25	0.15***					<0.001
Age				(0.08)	0.04	(0.16)	(1.89)	0.060
Sex				(1.04)	1.26	(0.08)	(0.82)	0.413
Education				(0.44)	0.40	(0.11)	(1.09)	0.278
Occupation				(0.24)	0.48	(0.05)	(0.51)	0.611
Marital Status				0.19	1.09	0.01	0.17	0.865
family monthly income				0.92	0.28	0.26	3.30	<0.001

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*T*	*Sig(p)*
family system				0.30	0.94	0.02	0.32	0.748
Smoking status				(0.77)	0.79	(0.07)	(0.98)	0.329
Comorbid medical disease				(0.16)	0.19	(0.06)	(0.82)	0.415
MI Severity				(3.47)	0.60	(0.39)	(5.75)	<0.001
Model Three	0.71	0.50	0.26***					<0.001
Age				(0.09)	0.04	(0.17)	(2.43)	0.016
Sex				(1.14)	1.03	(0.09)	(1.11)	0.269
Marital Status				0.09	0.89	0.01	0.10	0.918
Education				(0.48)	0.33	(0.12)	(1.46)	0.147
Occupation				0.01	0.39	0.00	0.02	0.981
Family monthly income				0.43	0.23	0.12	1.84	0.068
Family system				0.39	0.77	0.03	0.51	0.613
Smoking status				(0.58)	0.64	(0.06)	(0.91)	0.364
Comorbid medical disease				(0.05)	0.16	(0.02)	(0.34)	0.731
MI Severity				(0.44)	0.58	(0.05)	(0.76)	0.450
Type D personality				(0.50)	0.05	(0.64)	(9.63)	<0.001
Model Four	0.87	0.75	0.24***					<0.001
Age				(0.03)	0.03	(0.06)	(1.21)	0.228

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*T*	*Sig(p)*
Sex				(1.00)	0.75	(0.08)	(1.35)	0.180
Marital Status				0.22	0.66	0.01	0.33	0.741
Education				0.13	0.24	0.03	0.53	0.595
Occupation				(0.56)	0.28	(0.10)	(1.97)	0.060
Family monthly income				0.17	0.17	0.05	1.02	0.308
Family system				0.86	0.55	0.06	1.56	0.121
MI severity				0.31	0.42	0.03	0.73	0.468
Smoking status				(0.00)	0.49	(0.00)	(0.01)	0.992
Comorbid medical disease				0.01	0.11	0.00	0.10	0.920
Type D personality				(0.04)	0.05	(0.05)	(0.73)	0.464
Anxiety				(0.13)	0.08	(0.08)	(1.55)	0.122
Depression				(1.10)	0.10	(0.71)	(10.60)	<0.001
Social support				0.04	0.02	0.09	1.60	0.111

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ; β = Standardized coefficient ;SE= Standard Error t = estimated coefficient

5.30 Social Quality of Life (Time 1)

Preliminary analyses were conducted to justify the basic assumptions for hierarchical multiple regression of social QOL. Analysis revealed that the value for Durbin Watson statistic was 1.90, which indicated the independence of residuals. The values of tolerance and VIF revealed no issue of multicollinearity in the data (appendix 12, table 4). Only one outlier was detected during casewise diagnostics (appendix 12, table 5). The shape of histogram and the normal P-P suggested no major violation of normality (appendix 12, fig 9 &10). The scatterplots (appendix 12) showed that the assumption of linearity and homoscedasticity had not been violated (appendix 12, fig 11 &12).

Table 5-35, presents the regression analysis of social quality of life. Sociodemographic variables were entered in first step and these variables accounted for 8.0 % ($F (7, 183) = 2.34$; $p= 0.026$) of the variance in social quality of life. In sociodemographic variables only family monthly income ($\beta = 0.30$, $p=0.005$) was identified as a significant predictor of social quality of life. Clinical variables were entered in step 2 and increased the variance up to 22.0% ($F (10, 180) = 5.16$ $p< 0.001$). MI disease severity ($\beta = - 0.34$, $p< 0.001$) and smoking status ($\beta = - 0.21$, $p= 0.007$) were identified as most significant predictors. Family monthly income ($\beta = 0.23$, $p= 0.005$) still remained a significant sociodemographic predictor of social quality of life. Type D personality was introduced in the model at step 3 and the total variance explained by the model as a whole reached up to 51.0% ($F (11, 179) = 16.66$; $p < 0.001$). Type D

personality (β = -0.65, p< 0.001) was identified as most significant predictor at step 3. However along with Type D personality, smoking status (β = -0.19, p< 0.001) also remained a significant predictor. In the final model anxiety, depression and social support were entered. The final model accounted for 68.0% (F (14, 176) = 26.73; p < 0.001) of the variance. In the final model, depression (β = -0.52; p<0.001) and anxiety (β = -0.18, p=0.005), were identified as significant predictors of social quality of life .Whereas Type D personality (β = -0.19, p= 0.013) and smoking status (β = -0.12, p= 0.029) also remained significant predictors of social quality of life.

Table 5-35: Hierarchal multiple regression analysis of Social Quality of Life (n=191)

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.29	0.08	0.08*					0.026
Age				(0.04)	0.02	(0.15)	(1.68)	0.095
Sex				0.53	0.64	0.08	0.82	0.413
Marital Status				(0.17)	0.60	(0.02)	(0.28)	0.779
Education				(0.09)	0.22	(0.05)	(0.43)	0.671
Occupation				0.00	0.26	0.00	0.02	0.986
Family monthly income				0.53	0.15	0.30	3.47	0.001
Family system				0.25	0.50	0.04	0.49	0.622
Model Two	0.48	0.22	0.14***					<0.001
Age				(0.03)	0.02	(0.11)	(1.27)	0.206
Sex				(0.17)	0.65	(0.03)	(0.26)	0.792
Marital Status				0.00	0.56	0.00	0.00	0.999
Education				(0.21)	0.21	(0.10)	(0.99)	0.323
Occupation				0.09	0.25	0.03	0.36	0.719
Family monthly income				0.41	0.14	0.23	2.87	0.005
Family system				(0.31)	0.49	(0.05)	(0.63)	0.526

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
MI Severity				(1.52)	0.31	(0.34)	(4.90)	<0.001
Smoking status				(1.11)	0.41	(0.21)	(2.72)	0.007
Comorbid medical disease				(0.03)	0.10	(0.02)	(0.31)	0.758
Model Three	0.71	0.51	0.28***					<0.001
Age				(0.03)	0.02	(0.12)	(1.70)	0.091
Sex				(0.23)	0.52	(0.03)	(0.44)	0.663
Marital Status				(0.05)	0.45	(0.01)	(0.11)	0.912
Education				(0.23)	0.17	(0.11)	(1.37)	0.174
Occupation				0.22	0.20	0.08	1.13	0.259
Family monthly income				0.15	0.12	0.08	1.27	0.207
Family system				(0.26)	0.39	(0.04)	(0.68)	0.499
MI Severity				0.09	0.30	0.02	0.31	0.758
Smoking status				(1.01)	0.33	(0.19)	(3.09)	<0.001
Comorbid medical disease				0.02	0.08	0.02	0.31	0.758
Type D personality				(0.27)	0.03	(0.67)	(10.13)	<0.001
Model Four	0.83	0.68	0.17***					<0.001
Age				(0.01)	0.02	(0.02)	(0.43)	0.659
Sex				(0.08)	0.43	(0.01)	(0.19)	0.844

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Marital Status				(0.07)	0.38	(0.01)	(0.18)	0.853
Education				0.05	0.14	0.02	0.37	0.715
Occupation				(0.01)	0.16	(0.00)	(0.04)	0.965
Family monthly income				0.04	0.10	0.02	0.39	0.679
Family system				(0.03)	0.32	(0.00)	(0.10)	0.931
MI Severity				0.39	0.24	0.09	1.61	0.107
Smoking status				(0.62)	0.28	(0.12)	(2.21)	0.029
Comorbid medical disease				0.05	0.07	0.03	0.72	0.472
Type D personality				(0.08)	0.03	(0.19)	(2.50)	0.013
Anxiety				(0.13)	0.05	(0.18)	(2.88)	0.005
Depression				(0.41)	0.06	(0.52)	(6.98)	<0.001
Social support				0.01	0.01	0.05	0.82	0.415

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ; β = Standardized coefficient ;SE= Standard Error t = estimated coefficient

5.31 Environmental quality of Life (Time 1)

Assessment of basic assumptions for hierarchical multiple regression analysis of environmental quality of life at time 2 assessments revealed that there was independence of residuals, indicated by a Durbin-Watson statistic of 1.92. The values for tolerance (>0.1) and VIF (<10.0) indicated no multicollinearity among the variables (appendix 12, table Y-6). One outlier with standardized residuals values more than +3.3 was detected in the data (appendix 12, table 7). The assumption of Normality was checked from histograms (appendix 12, fig 13). The normal P-P plots generated as a part of regression procedure, showed no major violation of linearity and normality (appendix 12, fig 14). The scatterplots (appendix 12, fig Y-15 & Y-16) indicated an even spread of residuals over the predicted values of the dependent variable, which means that the assumption of homoscedasticity had not been violated.

Table 5-36, shows the hierarchical multiple regression analysis of environmental quality of life. Sociodemographic variables such as age and sex, occupation, family monthly income, marital status, family system and education were entered first in the regression model. This model was statistically not significant ($F (7, 183) = 1.35$; $p = 0.229$) and explained only 5.0 % of variance in environmental quality of life. In the first model only family monthly income ($\beta = 0.22$, $p= 0.012$) was identified as a significant predictor of environmental quality of life.

Clinical variables (MI severity, smoking status and comorbid medical diseases) were entered in step two. After entry of clinical variables at Step 2 the total variance explained by the model as a whole was 24.0% ($F (10, 180) = 5.81$; $p < 0.001$). MI disease (higher impairment of LVEF) severity ($\beta = -0.41$, $p< 0.001$) and smoking status ($\beta = -0.21$, $p=0.006$) were identified as significant clinical predictors.

Type D personality was entered at step 3. The introduction of Type D personality ($\beta = -0.65$, $p< 0.001$) increased the variance up to 51.0 % ($F (11, 179) = 16.89$; $p <0 .001$) in environmental quality of life, after controlling for sociodemographic and clinical variables. However smoking status ($\beta = -0.20$, $p< 0.006$) still remained significant predictors of environmental quality of life. Anxiety, depression and social support were added at the last step which further increased the variance significantly up to 64.0 %($F (14, 176) = 22.21$; $p < 0.001$). In the final model, social support ($\beta = 0.31$, $p<0 .001$) and depression ($\beta = -0.27$, $p< 0.001$) were identified as most significant predictors, whereas Type D personality ($\beta = -0.24$, $p= 0.003$), and smoking status ($\beta = -0.12$, $p< 0.040$) still remained significant predictor of environmental quality of life in the final model.

Table 5-36: Hierarchal multiple regression analysis of Environmental Quality of Life (n=191)

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Model One	0.22	0.05	0.05					0.229
Age				(0.06)	0.06	(0.09)	(0.98)	0.327
Sex				0.45	1.59	0.03	0.29	0.775
Marital Status				(0.80)	1.47	(0.04)	(0.54)	0.588
Education				(0.08)	0.55	(0.01)	(0.14)	0.891
Occupation				(0.41)	0.65	(0.06)	(0.63)	0.527
Family monthly income				0.96	0.38	0.22	2.55	0.012
Family system				1.14	1.23	0.07	0.92	0.356
Model Two	0.49	0.24	0.20***					<0.001
Age				(0.03)	0.06	(0.04)	(0.51)	0.607
Sex				(1.28)	1.56	(0.08)	(0.82)	0.413
Education				(0.40)	0.49	(0.08)	(0.80)	0.424
Occupation				(0.18)	0.59	(0.03)	(0.30)	0.764
Marital Status				(0.29)	1.34	(0.02)	(0.22)	0.830

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
family monthly income				0.63	0.34	0.15	1.85	0.066
family system				(0.51)	1.16	(0.03)	(0.44)	0.660
MI Severity				(4.49)	0.74	(0.41)	(6.04)	<0.001
Smoking status				(2.72)	0.97	(0.21)	(2.80)	0.006
Comorbid medical disease				(0.13)	0.24	(0.04)	(0.54)	0.587
Model Three	0.71	0.50	0.27***					<0.001
Age				(0.03)	0.04	(0.05)	(0.75)	0.457
Sex				(1.41)	1.26	(0.09)	(1.12)	0.264
Marital Status				(0.41)	1.09	(0.02)	(0.37)	0.708
Education				(0.44)	0.40	(0.09)	(1.11)	0.268
Occupation				0.14	0.48	0.02	0.29	0.771
family monthly income				0.02	0.28	0.01	0.07	0.947
family system				(0.41)	0.94	(0.02)	(0.43)	0.666
MI Severity				(0.70)	0.71	(0.06)	(0.99)	0.326
Smoking status				(2.49)	0.79	(0.20)	(3.16)	0.002
Comorbid medical disease				0.00	0.19	0.00	0.00	0.999
Type D personality				(0.63)	0.06	(0.65)	(9.84)	<0.001
Model Four	0.80	0.69	0.13***					<0.001

Variables	*R*	*R2*	*R2 Change*	*B*	*SE*	*β*	*t*	*Sig(p)*
Age				0.02	0.04	0.04	0.62	0.531
Sex				(0.77)	1.10	(0.05)	(0.70)	0.495
Marital Status				0.42	0.97	0.02	0.43	0.674
Education				0.05	0.35	0.01	0.13	0.889
Occupation				(0.20)	0.42	(0.03)	(0.49)	0.628
Family monthly income				(0.19)	0.25	(0.05)	(0.78)	0.427
Family system				0.04	0.82	0.00	0.05	0.964
MI Severity				0.04	0.63	0.00	0.07	0.953
Smoking status				(1.50)	0.72	0.12)	(2.08)	0.040
Comorbid medical disease				0.01	0.17	0.00	0.07	0.949
Type D personality				(0.23)	0.08	(0.24)	(2.99)	0.003
Anxiety				(0.19)	0.12	(0.10)	(1.57)	0.102
Depression				(0.51)	0.15	(0.27)	(3.34)	<0.001
Social support				0.16	0.04	0.31	4.44	<0.001

R2 = amount of variance explained by IVs ; R2 Change = additional variance in DV ; B = Unstandardized coefficient ;β = Standardized coefficient ; SE= Standard Error; t = estimated coefficient

5.32 Changes in Psychosocial Variables between Time 1 and Time 2 Assessments

5.33 Assessment procedures

This section presents the differences between time 1 and time 2 assessments. The analysis was done to determine the change in Type D personality characteristics, the level of anxiety, depression, social support and quality of life from baseline to 9 months follow up. Paired sample t test was used to assess the difference between time 1 and time 2 assessments. Paired sample t test was used because the same participants were assessed at 2 points in time i.e. at baseline after the first time diagnosis of MI and at 9 months follow up. Where the data did not fulfill the assumptions for parametric analysis, an alternative non-parametric technique (e.g. paired sample sign test) was used.

Table 5-37 depicts the z scores for skewness and kurtosis values of difference scores calculated between baseline assessment (time 1) and 9 months follow up(time 2). The numbers of outliers identified in boxplot are also mentioned with the difference score of each variable.

Table 5-37: Normality analysis of the difference score of variables computed between the scores of time 1& time2

Variables	*N*	*Mean (S.D)*	*Skewness (S.E)*	*z-score*	*Kurtosis(S.E)*	*z-score*	*outliers*
Difference_TypeD personality	191	-1.81(3.65)	-0.17(0.18)	-0.95	0.65(0.35)	1.86	6
Difference _anxiety	191	-1.55(3.60)	-0.59(0.18)	-3.28	0.84(0.35)	2.40	4
Difference_depression	191	-1.29 (2.85)	-0.50(0.18)	-2.78	0.44(0.35)	1.26	6
Difference_social Support	191	3.04(8.69)	0.49(0.18)	2.72	3.85(0.35)	11.0	29
Difference physical QOL	191	2.46(6.43)	-0.25(0.18)	-1.39	0.43(0.35)	1.23	2
Difference psychological QOL	191	1.15(5.37)	-0.22(0.18)	-1.22	0.11(0.35)	0.31	2
Difference social QOL	191	0.02(3.09)	-0.20(0.18)	-1.11	-0.16(0.35)	-0.46	1
Difference environmental QOL	191	2.99(6.56)	0.02(0.18)	0.11	-0.13(0.35)	-0.37	1

5.33.1 ***Effect size***

Effect size was also calculated for each variable and reported with the results. Effect size was calculated to determine the magnitude of the significance of results. Effect size is reported as Cohen's d, or simply referred to as "d." The guidelines for interpreting the values of Cohen's d as reported by Cohen (1988) are as follows.

Table 5-38: Interpretation of the Cohen's d values for effect size

Effect size	***Strength***
0.2	Small
0.5	Medium
0.8	Large

The Cohen's (1988) effect size'd' for paired sample t test is calculated by dividing mean difference by the standard deviation of the difference. The formula is as follows.

$$d = \frac{M}{SD}$$

Where M is the mean of the difference between the two related groups and SD is the standard deviation of this difference. These 2 values are calculated as a part of paired sample t test analysis and presented in tables (5-39 & 5-42) for Type D personality, anxiety, depression and quality of life.

5.33.2 ***Procedure for Paired sample T test analysis***

To assess the basic assumptions for paired sample t test, it was ensured that the dependent variable i.e. quality of life was measured at the continuous (ratio or interval). The independent variable consisted of two related groups. Related groups mean having same participants in each group. In the current study same MI patients were assessed at 2 points in time i.e. baseline (time 1) and 9 months follow up.

The difference between time 1 and time 2 on scores of each dependent variable was computed and the assumption of normality (table 5.35) and outliers were assessed on the difference score. The difference score for each dependent variable was computed with SPSS (version 20) and labeled as a new variable. For example the difference between scores of depression at time1 and time 2 was computed and labeled as difference_ depression. The assumption of normality and outliers were tested on the newly computed scores of difference_ depression.

Following section presents the change in the level of psychosocial variables between time 1 and time 2 assessments.

5.33.3 ***Type D personality***

The paired sample t test was used to determine if there was a statistically significant mean difference in the scores of Type D personality traits from time 1 (2-8 weeks following MI) to time 2(9months follow up) assessments .

The assumption of normality was not violated as assessed by z scores for skewness (z= - 0.95), Kurtosis (z=1.86) and inspection of histogram (appendix 13, fig 1). Assessment of Type D personality revealed six outliers (appendix 13, fig Z-2). Inspection of boxplot did not reveal them to be extreme therefore they were kept in the analysis. Paired sample t test analysis revealed MI patients exhibited stronger Type D personality traits at time 2(mean=26.20, SD= 8.44) as compared to time 1(mean=24.40, SD= 7.42), t (190) = -6.84, p<0.001, (95% Cl, -2.33 to -1.29) assessment (table 5.37). Cohen effect size value (d=0.50) demonstrated medium practical significance of the test's results.

5.33.4 ***Anxiety***

Paired sample t test was also computed to assess the change in the level of anxiety from time 1(baseline) to time 2 assessments at 9 months follow up. The assessment of normality revealed a little higher z value for skewness (z= -3.28) and inspection of histogram revealed slightly negatively skewed distribution (appendix 13, fig Z-3). Four outliers were detected from boxplot (appendix 13,fig Z-4) however inspection of their values did not reveal them to extreme therefore they were kept in the analysis. Keeping in view the large sample size (N=191) and quality of paired sample t test being tolerant against the violation of normality (Pallant, 2007) the same data was used for further analysis.

T test analysis revealed that MI patients reported high level of anxiety at 9 months follow up (mean=11.83, SD= 4.36) as compared to baseline assessment

(mean=10.28, SD= 3.74), t (190) = -5.97, p<0.001, (95% CI, -2.07 to -1.04). Cohen effect size value (d=0.43) suggested medium practical significance.

5.33.5 ***Depression***

Normality analysis of data for depression revealed that value of z scores for kurtosis (z=1.26) was within the range of ±2.58, whereas the z scores value for skewness (z= -2.78) was a little higher than the desired range (z=±2.58). Keeping in view the shape of histogram (appendix 13, fig Z-5) and large sample size (N=191) this slight violation of normality did not cause problem in data analysis. Inspection of the boxplot (appendix 13, fig Z-6) revealed six outliers, however their values were not identified as extreme, therefore they were kept in the analysis.

T test analysis revealed that there was a statistically significant change in level of depression among MI patients at baseline(time 1 assessment) and 9 months follow up(time 2 assessment) . MI patients exhibited higher level of depression at 9 months follow up (mean=11.60, SD= 4.24) as compared to baseline assessment after 2-8 weeks of diagnosis (mean=10.30, SD= 3.54), t (190) = -6.31, p<0.001, (95% CI, -1.71to -0.89) (table 5.37) .Further Cohen effect size value (d=0.46) suggested moderate practical significance.

Table 5.39 demonstrates the change in Type D personality, anxiety and depression from baseline (time 1) to 9 months follow up (time 2) assessment.

Table 5-39: Change in Type D personality, anxiety and depression between time 1 to time 2 assessments

Variables	*Assessment time*	*Total participants (N)*	*Mean (M)*	*Standard deviation (SD)*	*t*	*Sig (p)*
Type D	Time1	191	24.40	7.42		
personality	Time2	191	26.20	8.44	-6.84	<0.001
Anxiety	Time 1	191	10.28	3.74		
	Time2	191	11.83	4.36	-5.97	<0.001
Depression	Time 1	191	10.30	3.54		
	Time2	191	11.60	4.24	-6.31	<0.001

5.33.6 ***Social support***

Analysis of social support revealed 29 outliers with extreme values (appendix 13).The inspection of histogram and z values for skewness (z=2.72) and kurtosis (z=11.0) also revealed that distribution of difference score of social support was neither normal nor symmetrical. It was therefore decided to use paired sample signed test (non-parametric technique) to assess whether there was a difference between the median scores of social support at time 1 and time 2 assessments. In this study the data met the required assumptions for the analysis using paired sample sign test (Laerd statistics, 2013). The details about the assumptions for paired sample signed test are given in the data analysis section of methods.

Since the data of current study fulfill the basic assumption of paired sample sign test, therefore sign test was run to measure the change in social support from time 1 to time 2 assessments. The analysis revealed that there was no change

in the median scores of social support at time 1(median=77) and time 2 assessment (median =77) and median difference between two scores was zero (table 5.40). Fifty five MI patients reported decrease in social support at 9 months follow up (time2) as compared to baseline assessment (time1). Fifteen patients reported increase in the level of social support at time 2 assessment, whereas hundred and twenty one patients reported no change in the level of social support between time 1 and time 2 assessments (table 5.41). Although sign test revealed significant decrease ($z= -4.66$, $p<0.001$) in social support at time 2 assessment as compared to time 1 assessment. However this should be interpreted with cautious because sign test only consider negative (N=55) and positive (N=15) differences and p value was based on these 55 negative and 15 positive differences. In this data there were 121 participants who had tied (same) values but sign test did not consider these 121 participants. The median scores for social support at time 1(median=77) and time 2 (median=77) assessment indicated no difference in median at two points in time.

Table 5-40: Difference in the median scores of social support between time 1 and time 2 assessments

Variables	*Assessment time*	*N*	*Percentiles*			*z*	*p*
			25th	*50th (median)*	*75th*		
Social	Time 1	191	71.00	77.00	88.00	-4.66	<0.001
support	Time2	191	65.00	77.00	88.00		

Table 5-41: Change in scores of social support between time 1 and time 2 assessment (N=191)

Variable	*change in scores*	*N*
social support time 2 - social support time 1	social support time 2 < social support time 1a	55
	social support time 2 > social support time 1b	15
	social support time 2 = social support time 1c	121
	Total	191

5.34 Change in Quality of Life between Time 1 and Time 2 Assessments

5.34.1 ***Physical quality of life***

Paired sample t test was computed to assess the statistically significant change in physical quality of life in MI patients between time 1 and time 2 assessments. . Inspection of histogram (appendix 13, fig Z-6) and z values for skewness (z=-1.39) and kurtosis (z=1.23) revealed no violation of assumption of normality. The analysis also revealed two outliers which were more than 1.5 box length from edge of the box in a boxplot (appendix 13, fig Z-7). However they were not identified as extreme outliers therefore they were kept in the analysis. Physical quality of life of MI patients significantly decreased at time 2 assessment (Mean=18.41, SD=7.05) as compared to time 1(mean=20.87, SD= 5.01), t (190) = 5.29, p<0.001, (95% Cl, 1.54 to 3.38) assessment (table 5.39). Value of Cohen effect size (d=0.38) suggested small to medium practical significance of the analysis.

5.34.2 ***Psychological quality of life***

Preliminary analysis for assumption of normality was also not violated as it was evident from histogram (appendix 13, fig Z-8) and z scores for skewness (z=-1.22) and kurtosis (z=0.31) values (table 5.35). The assessment for outliers revealed two outliers (appendix 13, fig Z-9) which were not extreme; therefore they were kept in the analysis. The analysis revealed statistically significant decrease in psychological quality of life at time 2 (mean=17.59, SD= 6.59), t (190) = 2.94, p<0.001, (95% Cl, 0.38 to 1.91) assessment as compared to time

1 (mean= 18.74, SD=5.30) assessment (table5.39). Further Cohen effect size value (d=0.21) suggested small practical significance of the analysis.

5.34.3 ***Social quality of life***

A paired sample t test was used to determine if there is statistically significant change in social quality of life between time 1 and time 2 assessments. Analysis of the boxplot of difference score for social QOL identified one outlier (appendix 13, fig Z-10). Inspection of its value did not reveal it to be extreme; hence it was kept in the analysis. Visual inspection of histogram (appendix 13, fig Z-11) and z scores for skewness (z=-1.11) and kurtosis (z= -0.46) revealed that the assumption of normality was not violated (table 5.35). Analysis of paired sample t test revealed statistically no significant change between time 1(mean=8.91, SD=2.94) and time 2 (mean=8.89, SD= 3.34), t (190) = 0.09, p=0.93, (95% CI, -0.42 to 0.46) assessments (table 5.39). The results revealed that the social quality of life of MI patients did not significantly change from baseline assessment (time1) to 9 months follow up (time 2). The value of Cohen's effect size (d=0.01) suggested no practical significance.

5.34.4 ***Environmental quality of life***

To determine the change in environmental quality of life of MI patients from time 1 (baseline) to time 2 (9 months follow up) assessments a paired sample t test was used to analyze the data. Inspection of boxplot (appendix 13, fig Z-12) revealed 1outlier which was more than 1.5 box length from edge of the box, however its value was not extreme; therefore it was kept in the analysis. The

assumption of normality was not violated as assessed by z values for skewness and kurtosis. Inspection of histogram also supported the normality of the data (appendix 13, fig Z-13). T test analysis revealed a statistically significant change in environmental quality of life from time 1(mean=22.85, SD=6.96) to time 2(mean =19.86, SD=8.11), t (190) = 6.29, p<0.001, (95% Cl, 2.05 to 3.93) assessments (table 5.39). The results showed that the environmental quality of life was more impaired at 9 months follow up as compared to initial assessment (time1) within 2-8 weeks of diagnosis of MI. The value of Cohen's effect size (d=0.46) suggest moderate practical significance of the test.

Table 5-42 depict the change in quality of life (physical, psychological, social, & environmental QOL) from time 1 to time 2 assessments in MI patients.

Table 5-42: Change in quality of life between time 1 and time 2 assessments

Variables	*Assessment time*	*Total participants (N)*	*Mean (M)*	*Standard deviation (SD)*	*t*	*Sig (p)*
Physical QOL	Time 1	191	20.87	5.01		
	Time2	191	18.41	7.05	5.29	<0.001
Psychological QOL	Time 1	191	18.74	5.30		
	Time2	191	17.59	6.59	2.95	<0.001
Social QOL	Time 1	191	8.91	2.94		
	Time2	191	8.89	3.34	0.09	0.925
Environmental	Time 1	191	22.85	6.96		
QOL	Time2	191	19.86	8.11	6.29	<0.001

6 Discussion

6.1 Introduction

In this study the prognostic impact of psychosocial variables (Type D personality, depression, anxiety & social support) on quality of life of patients post MI was assessed. To the best of my knowledge this is the first prospective cohort study conducted in Pakistan which investigated the impact of psychosocial predictors on quality of life of MI patients at baseline (2-8 weeks following MI) and at 9 months follow-up. In the initial assessment, 300 patients were recruited and assessed between 2 to 8 weeks (time 1) of a diagnosis of myocardial infarction. The same patients were contacted and interviewed 9 months (time 2) after initial assessment. A total of 191 patients were assessed again at time 2.Psychosocial predictors such as Type D personality, depression, anxiety and social support were measured both at time 1 and time 2. The same questionnaires were used to assess psychosocial variables in MI patients at baseline (time1) and after 9 months (time2). Distress scale 14(DS-14) was used to measure Type D personality and the hospital anxiety and depression Scale (HADS) was used to assess depression and anxiety in these patients. Social support was measured with the social support Scale (SSS). Quality of life was also assessed at time 1 and time 2 with the WHO quality of life scale (WHOQOL-BREF).

This chapter presents a discussion of key findings and results. The results are extensively discussed and evaluated with respect to the aims, objectives and

hypotheses of the present research. The discussion is conducted in the same sequences as the results are presented in chapter 5. The study findings are also discussed in the context of the wider research literature. The results are further elaborated in the light of supporting and contradicting research evidence. The novelty of the research findings with reference to Pakistani culture and its implications for research and clinical practice are discussed. The final section includes, summary of the findings, strengths and methodological limitations of the study, clinical and theoretical implications, and recommendations for future research in this field. Recommendations for personality and psychological assessment of cardiac patients are given to enhance their quality of life and help in improving rehabilitation programs. The chapter concludes with the contributions of the present research in the field of psychosocial aspects of cardiovascular research with special reference to the Pakistani population.

The main aims of the study were; (1) to examine psychosocial predictors (Type D personality, anxiety, depression and social support) in MI patients; (2) to identify significant predictors of quality of life (physical, psychological, social & environmental quality of life) in patients post MI. These aims were further divided into the following objectives.

i. To assess Type D personality characteristics at baseline (time 1assesment) and at time 2 assessment.
ii. To identify gender differences between Type D and non-Type D participants at time 1 and time 2.

iii. To measure levels of anxiety and depression in MI participants.

iv. To assess symptoms of anxiety in Type D and non-Type D patients at time 1 and time 2 assessments.

v. To assess symptoms of depression in Type D and non-Type D patients at time 1 and time 2 assessments.

vi. To identify gender differences in levels of anxiety and depression at time 1 and time 2 assessments.

vii. To determine the relationship between sociodemographic, clinical and psychosocial variables with quality of life (physical, psychological, social & environmental QOL) at time 1 and time 2 assessments.

viii. To identify significant predictors of different dimensions of quality of life (physical, psychological, social & environmental QOL) at time 1 and time 2 assessments.

ix. To assess the difference in psychosocial variables between time 1 and time 2.

6.2 Sociodemographic and Clinical Characteristics of Participants

A sample of 300 MI participants were recruited, during baseline assessment after 2-8 weeks of first time diagnosis of MI. A significant sample was selected in order to generalize the findings of the current study to MI patients in Pakistan.

The descriptive analysis of the sociodemographic data revealed that the sample consisted of 52.0 % (n=156/300) males and 48.0% (n=144/300) females. The mean age (years) of the participants was 50.7 (mean age males=51.0, mean

age females=50.40) with years ranging from 25 to 80.Majority of the participants were married (n=232/300; 77.3%).The educational qualification of 65.0% of participants (195/300) ranged from 5^{th} to 12^{th} grades. A significant number (70.8%) of female participants were housewives (n=102/144) and only 29.0% of all participants (n=87/300) were employed on a full time basis. The family monthly income of 52.9% of participants (159/300) was less than Rs 40,000. The majority of the participants (n=193/300; 64.3%) belonged to a joint family system (table 5.2).

Analysis of clinical characteristics of the total sample revealed that 123 participants had mild to moderate level of MI disease severity based on the assessment of left ventricular ejection fraction (LVEF). 45.3%of participants (136/300) were either current or had previous history of smoking. Regarding comorbid diseases, 42.7% participants (n=128/300) had one comorbid disease while 26.6% participants (n=80/300) were suffering from two comorbid diseases prior to the diagnosis of MI (table 5.3).

From the total sample recruited at time 1 assessment, 191 participants responded at the 9 months follow up (time 2). No significant differences were found in the distribution of sociodemographic and clinical characteristics of participants between time 1 and time 2 assessments (table 5.6).

Other studies conducted in Pakistan also reported similar sociodemographic characteristics. The findings of our study were also support by a research (Jafar et al., 2007) on coronary artery disease epidemic in Pakistan, which also

reported that the mean age (years) of male patients with definite CAD was 51.3 years and female patients was 50.9 years. The results also revealed that more male patients were identified with definite CAD as compared to female patients.

Bokhari et al. (2002) in their study on the prevalence of depression in patients with CAD reported that the mean age was 54.2(SD=12.1) years in a total sample of 54(Males=74.7%; females=25.3%) participants. 40.3 % of patients had no academic qualification and 45.5 % were educated from 5 to 10 grades. In the total sample 55.8% participants had monthly income of less than Rs 5000. 84.4% were married and prevalence of depression was 37.0% in the patients with CAD. Sociodemographic variables such as female sex, low level of income, low level of education, and co-morbidity such as hypertension were identified as major factors associated with depression in CAD patients.

Assad (2004) in her study on the relationship between social support and depression following MI reported the age range of the participants was between 30-80 years. Eighty two percent (82%) of the patients were married and living in extended (66.0%) or joint family system (34.0%). The percentage of male and female patients was equal. 72.0% of female patients were housewives. 36.0% participants were current smokers and 52.0% were educated up to 10th grade and 23.0% had no educational qualification. Another cross-sectional study conducted in Pakistan on type D personality, anxiety, depression and perceived social support in MI Patient and their spouses, reported that the mean age of participant was 55 years (Bashir , 2009) . 96.0% of female participants (spouse or patient) were housewives. As for the educational level 55.0% patients were in

the range of completing grades 5 to 10. 40.0% of the couples reported family monthly income between Rs 3000 to Rs 8000.

Dogar et al (2008) also reported the mean age of cardiac patients 52.2 % (years) in their study on prevalence and risk factors for depression and anxiety in hospitalized cardiac patients in Pakistan. In a total sample of 100 patients, 60.0 % of the patients were males. Khan (2004) in his study on the psychiatric morbidity in MI patients in Pakistan reported that mean age of participants was 50.6 with a range from 33 to 75 years. A research study on the type D personality as predictor of impaired quality of life in MI patients reported that 47.0 % of MI patients were in the age range of 51-55 years and 39.0% were in the age range of 56-60 years in the total sample of 80 MI (males=49 ; females=31) patients (Saeed et al., 2011).

Hafizullah et al.(2011) in their study on anxiety and depression in patients (N=200) with acute myocardial infarction(AMI) and healthy controls (N=200) reported the mean age of the AMI patients was 59 years (SD=11) and that of healthy controls was 52 years(SD=10). In the total sample, 72.2% were males.

In the current study more males (n=156/300; 52.0%) as compared to females (n=144/300; 48.0%) were diagnosed with definite MI. This can be attributed to a number of factors such as low prevalence of MI in females during reproductive years, lack of appropriate diagnostic and medical facilities especially for females belonging to a lower socioeconomic class, and preferential treatment to males in Pakistani culture. Women are often neglected in terms of providing medical

treatment. Even in western culture Richards et al (2000) reported that men are more likely to present with chest pain and are diagnosed with coronary heart disease by a general practitioner as compared to women. Another study (Jafary et al., 2007) conducted in 17 major hospitals in Pakistan, on the profile of patients with acute myocardial infarction reported that almost 68.0 % of patients were males in a total sample of 1400 participants. The mean age was 52.2 with a range of ±10.7 years.

The mean age (mean=50.7) of cardiac patients reported in the current study and other studies (Jafar et al., 2007; Bashir, 2009; Dogar et al.,2008 ; Jafary et al., 2007) conducted in Pakistan is comparatively low as compared to studies conducted in other countries.

Pedersen et al., (2002) in their study on the role of personality and social support on distress and perceived health in MI patients, reported 30.0% of the participants were females. The mean age was 60 years and 88.0% were either married or had a partner. 42.0 % patients were employed /working, 13.0% had severe impairment in LVEF, and 12.0% were current smokers.

A research study (Volz et al., 2011) in Switzerland investigated the effect of multiple psychosocial variables (type D personality, depression, anxiety, vital exhaustion & social support) on mortality, readmissions and health related quality of life in chronic heart failure patients. In this prospective cohort study, a total sample of one hundred and eleven patients was recruited to an exercise based program. The mean age was 57 with the range of 18 to 79 years(Volz et

al., 2011). Williams (2012) reported the mean age of participants was 66.03 years (SD=10.7, range =40 -88) in the total sample of 205 (59 female & 146 male) cardiac patients. Even in South Asian countries such as China (Yu et al. 2011), the mean age of the patients was reported to be 67.3 (S.D =11.9) years. In the total sample of 326 cardiac patients majority were males (217/326; 66.5%) and married (286/326; 87.7%) 17.8 % patients (58 /326; 17.8 %) were living with spouses and 69.0% (225/326; 69.0%) were living with family members. 30.7% were educated up to 5th grade. Hundred and eighty one (n=181/ 326; 55.5%) CHD patients reported hypertension, while hundred and sixteen (n=116/326; 35.5%) reported diabetes as comorbid diseases (Yu et al. 2010).

Various factors such as poverty, poor dietary habits, unhealthy life styles, psychosocial stressors and lack of appropriate health care facilities may contribute to early development of heart disease in Pakistan.

In the current study the majority of the participants were married (n=232/300; 77.3%) and living in a joint family system (n=193/300; 64.3%). These findings are in line with Dogar et al (2007) study which reported that 84.0 % patients (n=84/100; 84.0%) were married.

In the current study most of participants were in the lower income group and the education level of the majority (65.0 %) ranged from 5^{th} to 12^{th} grades. Family monthly income and education are indicators of socioeconomic status (SES). Low level of education and monthly income are more likely to be the predisposing factors leading to MI.

6.3 **Assessment of Type D Personality (Time1 & Time2)**

This section of the discussion focuses on the assessment of Type D personality characteristics of patients with myocardial infarction (MI) after 2-8 weeks of diagnosis (baseline- time one) and also 9 months follow up (time 2). Gender differences between Type D and non-Type D males and females patients are also discussed here.

Over the last decade Type D personality has emerged as a significant factor in cardiovascular diseases and research evidence has reiterated its adverse etiological and prognostic implications. Type D personality is characterized by negative affectivity (tendency to experience negative emotions across time and situation) and social isolation (tendency to inhibit expression of emotions in social interactions). Patients are classified as Type D if they have elevated scores ($\geq$ 10) on both the subscales of negative affectivity (NA) and social isolation (SI). Denollet (2012) reported that, an estimated prevalence of Type D personality ranged from 20.0% to 40.0% in patients with cardiovascular diseases based on the above mentioned classification.

In the current study, Type D was identified as one of the most significant psychosocial factors associated with MI. Type D was also found to be an important predictor of impaired quality of life in patients with MI.

Results of the present study revealed that 51.7% (n=155/ 300) of the MI patients were identified with Type D personality traits, during baseline line assessment within 2-8 weeks of diagnosis of MI. This is a significantly high percentage of

Type D personality characteristics found in MI patients. Similarly, the time 2 assessment at 9 months follow up, showed that 52.4% participants (n=100/191) were identified with Type D personality traits in the total sample of 191 participants (table 5.10). These findings support the evidence that Type D personality is a relatively stable construct, and therefore it is expected that Type D personality traits should show significant stability over time.

The results of the current study substantiate a study by Williams (2007) which found that 86.4 % of participants were consistently classified as Type D or non-Type D individuals both at baseline and at 3 months follow up assessments. The stability of Type D personality over time is also demonstrated by Pelle et al. (2008). In this study 26.6% of patients were identified with Type D personality prior to cardiac rehabilitation. There was 5.9 % reduction in Type D personality characteristics follow cardiac rehabilitation and 20.7 % patients ($\chi 2$ =6.30, p=0.012) were still classified as Type D individuals. Type D personality characteristics remained stable in 81.0% of the total patients and they were classified as Type D or non-Type D even after a 3 month post cardiac rehabilitation program when compared to the baseline (pre rehabilitation program) assessment.

The stability of Type D personality was further corroborated by Martens et al. (2007) who carried out a longitudinal study on Type D personality in patients post MI over a period of 18 months. Type D was assessed at three points in time. First of all at baseline during hospitalization for MI, secondly, at 12 months post MI and finally, at 18 months following the diagnosis of MI. The prevalence

of Type D personality was 18.3 % during hospitalization after the diagnosis of MI. The prevalence of Type D personality was 22.2 % at 12 months and 23.2 % at 18 months post MI. There was slight increase (3.9.0%) in the prevalence of Type D personality in the first year post MI. This study concluded that Type D personality was a stable taxonomy over the period of 18 months post MI and that the stability of Type D was not affected by disease severity. Furthermore it was independent of variability in mood (anxiety & depression) status in patients post MI.

Cross-sectional research studies conducted in Pakistan reported significantly high percentages of Type D personality in MI patients during baseline assessment following the diagnosis of MI. A study conducted by Gul & Ali (2009) on MI patients, identified 59.0% (n=59/100) of the MI patients had Type D personality traits. Bashir (2009) also carried out a cross-sectional study examining Type D personality, anxiety, depression and perceived social support in MI patients and their spouses. The study revealed that 45.0 %(n= 18/40) of MI patients and 27.0% (n= (10.8/40) of the spouses reported Type D personality characteristics.

Another study by Saeed et al (2011) looked at Type D as a predictor of quality of life following Coronary Heart Disease (CHD) and reported a high prevalence of Type D personality in MI patients. In the total sample of 80 MI patients and 70 healthy individuals, 33.0 % of healthy controls (n=23/ 70; 33.0%) and 71.0 % of MI patients (n=57/ 80; 71.0%) were identified with Type D personality (Saeed et al., 2011). This is a relatively high percentage of Type D individuals identified in

MI patients in Pakistan. All these studies used DS-14 for the assessment of Type D personality in cardiac patients.

However, research studies carried out on other cultural groups have reported different prevalence rates of Type D personality in cardiac patients. A study conducted on the assessment of Type D personality in Chinese patients with CHD reported the prevalence of Type D was 31.0% in the total sample of 326 patients (Yu et al., 2010). William et al. (2012) reported that the prevalence of Type D personality is 33.9 % in cardiac population and 39.0% in the general population in the UK & Ireland (Williams, 2007).

Romppel (2012) carried out a prospective cohort study on a German population of cardiac patients and reported that 26.6% of the patients were classified as Type D individuals at baseline assessment. A case-control study was conducted in the United Arab Emirates (UAE) to identify cardiac risk factors and psycho-social variables in patients with Coronary Artery disease (CAD).The sample consisted of 180 participants (90 case control & 90 CAD patients). In the CAD group 77.0% were immigrants from South Asia, 22.0 from the Middle East, and 1.0% from South East Asia. 27.0% of the patients were identified with Type D personality characteristics while 29.0% of the control groups were classified as Type D individuals. Both the CAD patient group and the control group did not differ significantly on the Type D personality measure (Haque, 2013). Therefore Type D was not identified as a significant factor associated with CAD in this population. These results contradict the findings of the current study where Type D is identified as a significant predictor for MI related outcomes (quality of life).

Keeping in view the above mentioned prevalence rates of Type D personality in different cultures, it is evident that the percentage of Type D personality in MI patients is relatively high in Pakistan when compared with other countries such as the United Arab Emirates Germany, China, the United kingdom & Ireland (Haque, 2013; Romppel, 2012; Yu et al., 2010; William et al., 2012).

Gender differences with respect to Type D personality were also assessed in the present research. Although the results depicted a statistically non -significant difference between males and females, slightly more variation was found for females as compared to males in terms of Type D personality characteristics. The results (table 5-14) revealed that the percentage of female participants with Type D personality traits was slightly higher at time 1 (2.20%) and time 2 (1.00%) assessments as compared to male participants. However the value of a qui square test at time1 (x^2 (1, N=300) = 0.137, p = 0.711) and time 2 (x^2 (1, N=191) = 0.550, p = 0.458) revealed that this difference was not significant.

Other studies have presented mixed results in relation to gender differences in Type D personality between males and females cardiac patients. Bashir (2009) reported no significant difference (t=1.10; p= 0.28) in terms of Type D personality between male and female MI patients and their spouses in a Pakistani population. Another comparative study carried out in Pakistan examined Type D personality and quality of life in cardiac patients and the general population (Naseer, 2007).This study did not demonstrate any significant gender difference in Type D personality in MI patients (t=1.30; p=0.17) when compared with healthy controls (t=1.00; p=0.31).

Furthermore, studies carried out on western cultural groups also supported these findings. Denollet et al. (2012) studied gender differences between Type D and non-Type D personality traits in Icelandic cardiac patients and found that 27.0 % male (n=53/ 199) participants and 25.0 % female (n=17/ 69) participants were identified with Type D personality. Williams et al. (2011) also reports that there was no significant (χ^2 (1, N=192) =.009, ns) association of gender with Type D personality in patients with MI in his research.

However these results contradict previous research studies which reported a higher percentage of Type personality traits in female (40.0%) participants as compared to male (26.0%) participants (Pedersen & Middel, 2001). Kupper et al. (2011) in their study on the cross cultural analysis of Type D personality in patients with ischemic heart disease (IHD) from 22 countries reported gender differences in Eastern Europe only. Their analysis of a sample of IHD patients from the Eastern European countries revealed that 41.0% of females and 32.0 % of males were identified with Type D personality characteristics (χ2=6.4, p=.01).

The present study findings support the majority of research showing a significant influence of Type D personality factor on mortality, and overall quality of life. These findings however have been fairly challenged by Coyne and Voogd (2012) who argued that Type D cannot be deemed as a determinant of mortality because of the lack of clear and reliable evidence in the literature. The authors have identified several studies with small, under-powered samples, which are

therefore considered as less valid in reporting type D personality as an independent determinant of mortality following a CVD. Similarly they (Coyne & Voogd, 2012) have also identified other challenges such as incoherent scoring criteria of the Type D scales, lack of follow-up studies and unclear descriptions of mortality rates leading to the need for further exploration of the association of type D personality in CVD outcomes.

It is very important to explore various reasons associated with such a high percentage of Type D personality traits in MI patients in Pakistan. Type D personality is characterized by negative affectivity and social inhibition. According to Denollet (2005) both these constructs signify the underlying psychological vulnerability to general distress. Negative affectivity, which is the tendency to experience negative emotions across time and situations, is characterized by dysphoria, anxious apprehension and irritability. Whereas social inhibition is defined as a tendency to inhibit expression of emotions and behaviour in social interaction it is represented by social discomfort, reticence and lack of social poise (Denollet, 2012).

In the current study, numerous factors may have contributed to this high rate of Type D personality in patients post MI. First, culture plays an important role in the development of the personality traits. Within the Pakistani culture people are expected to inhibit the expression of their emotions from childhood. Parenting styles and child rearing practices may contribute to the development of social inhibition which is one of the important factors of Type D personality. Since Type

D individuals experience negative emotions and have the tendency to inhibit themselves, they are less likely to engage in healthy behaviors such as exercise, outdoor activities, and having regular medical checkups. Stress can lead to people becoming more prone to unhealthy stress relief behaviors such as smoking. All these factors play an important role in the development and progression of cardiac diseases such as myocardial infarction. Keeping in view the escalating rates of Cardiovascular diseases (CVD) in Pakistan and India (Ranjith et al., 2005; Khan et al., 2006) and the results of the current study indicating a high prevalence of Type D personality in MI patients, it can be suggested that Type D personality may also contribute to the high risk of CVD in this region.

Given that Type D personality is a more general personality style rather than a mental health problem, such a person may live in a state of pessimism without any other symptoms of major depression, like changes in weight, sleep, concentration and activity level. Similarly, such personalities may avoid expressing their emotions but do not necessarily experience panic attacks or an overall sense of fear.

There may be several reasons for this population and cultural group having a Type D personality style. First, there is a genetic component to personality. Family styles and values may also shape the way we express ourselves. In some families, expressing emotions, especially negative ones may be seen as unacceptable. It is possible that people in Pakistan learn to suppress their emotions and ideals from an early age as living in a country with a huge divide

between rich and poor, with little middle ground, people have to learn to survive at the best of their ability and are encouraged to be grateful with whatever they have even if their prospects are pessimistic. The distress Type Ds experience due to social, political, personal and environmental stresses may cause the body to release stress hormones that, over a long period of time, have negative effects on cardiovascular functioning.

In more complex family situations, children who have been physically or sexually abused or come from families with social and psychological problems, there may be a culture of secrecy imposed on its members due to issues of honor and shame. It is also possible that, even in the absence of serious family problems, the Pakistani culture encourages a stoic approach to life which further perpetuates the suppression of negative emotions.

In the absence of health education to decrease or manage negative emotions and attitudes, these traits are unlikely to be modified. Furthermore in a society that does not encourage the processing of negative emotions, like sadness, anxiety and anger or have inbuilt systems such as psychological services to help alleviate these emotions then these traits will be all the more pervasive and harmful to health.

In addition, some people may manage their unexpressed negative emotions by engaging in unhealthy habits, like smoking, substance abuse and eating a high-fat, high-carbohydrate diet. All these are risk factors associated with cardiac diseases. Given this, it is important to take steps to help alter the Type D

personality style in MI patients as, despite having consistent and stable personality traits, personality styles can be flexible, given the right support such as being helped to practice relaxation and stress management.

6.4 Assessment of Anxiety and Depression (Time 1 & Time 2)

This section of the discussion focuses on the findings related to assessment of anxiety and depression in MI patients at baseline (time 1) and 9 months follow up (time2).

Substantial research evidence has demonstrated the association between psychological distress such as anxiety, depression and CVD. The current study also examined anxiety and depressive symptoms in MI patients and its impact on quality of life of these patients. It was found that 42.3 % participants (127/300) exhibited significant symptoms ("caseness" level) of anxiety at baseline assessment and the level of anxiety was increased to 60.7 %(116/191) at 9 months follow up (table 5-11). Data analysis also revealed that 46.3 % of participants (n=139/ 300) were identified with increased level ("caseness") of depression during time 1 assessment and the level of depression was increased up to 57.6% (n=110/ 191) at 9 months follow up (table 5-11). The analysis have also shown that there was significant difference in the level of anxiety between Type D and non-Type D patients at time 1 (x^2 (2, N=300) = 79.480, p = <0.001) and time 2 (x^2 (1, N=191) = 0.137, p = <0.001) assessments (table5-12). Participants with Type D personality reported a high level of anxiety as compared to non-Type D participants. Similarly a highly significant difference was found in the level of depression between Type D and non-Type D

participants both at time 1 (x^2 (2, N=300) = 134.726, p = <0.001) and time 2(x^2 (2, N=191) = 94.178, p = <0.001) assessments (table 5-13).

No gender difference was observed in the levels of anxiety between male and female participants at time 1 (x^2 (2, N=300) = 0.947, p = 0.623) and time 2(x^2 (2, N=191) = 1.171, p =0.557) assessments (table5-15). The analysis of depression also revealed non- significant gender difference at baseline (x^2 (2, N=300) = 0.617, p = <0.734) and 9 months follow up (x^2 (2, N=191) = 0.352, p = 0.839) (table 5.16).

These results expand and complement the existing literature from Pakistan and other developing countries which have documented that significant symptoms of anxiety and depression are reported by cardiac patients. Numerous studies conducted in Pakistan reported elevated levels of symptoms of anxiety and depression in patients with MI and other cardiac diseases. Research (Dogar et al., 2008) on hospitalized cardiac patients in Pakistan reported depression in 47.0% and anxiety in 16.0% of cardiac patients based on the DSM-IV criteria for depression and anxiety disorders. Other cross-sectional studies conducted in Pakistan also reported significant symptoms of anxiety and depression in patients after the diagnosis of MI. Bashir (2009) reported that 37.0% of the participants in her study had elevated level of depressive symptoms, whereas 35.0% of their spouses had elevated level of depressive symptoms. Scores on HADS also revealed that 57.0% of the MI patients had elevated level of anxiety symptoms, while 50% of the spouses also exhibited elevated level of anxiety. Gul & Ali (2009), in their study on Type D personality, psychological distress and

quality of life in MI patients, also found significant level of anxiety and depression in MI patients. Scores on HADS showed 43.0% of the participants had high level of depressive symptoms, while 46.0% of the participants had elevated level of anxiety symptoms. A study (Mohapatra et al., 2005) conducted in India on patients with AMI, reported major depression in 34.0% of patients. However research evidence of a study in Pakistan suggested that 14% of the MI patients experienced major depression and 18% exhibited mixed symptoms of anxiety and depression (Akhtar et al., 2004).

A study (Hafizullah et al., 2011) carried out in city of Karachi (Pakistan) reported a very high percentage of depression and anxiety in patients with acute myocardial infarction. HADS was used to assess the symptoms of anxiety and depression in 200 consecutive patients. Significantly elevated level of depression (HADS score >17) was identified in 77.5 %(155/200; 77.5%) of AMI patients. A separate score of anxiety was not reported, however the combined scores of depression and anxiety on HADS revealed that 83.0% (166/200; 83.0%) of patients scored >17 on the combined scores of anxiety and depression on the HADS scale. This is alarmingly high percentage (%) of anxiety and depression in AMI patients. Even in a control group of general population, 64.0 % of participants reported high level of depression and 70.0 % exhibited combined symptoms of anxiety and depression. Hafizullah et al.(2011) attributed high level of depression and anxiety to poverty, low socioeconomic status , terrorism, lawlessness , and injustice prevailing in the country.

Studies conducted in the West have also reported that anxiety and depression is common in patients with myocardial infarction. Our results are consistent with the research evidence which suggested that 46.0% of MI patients reported significant symptoms of anxiety and 41% exhibited depressive symptoms based on the scores of HADS (Bilge et al., 2006). The findings of the current study are also corroborated by the findings of other research studies which have demonstrated elevated levels of anxiety and depression in MI patients. Lane et al.(2002) measured the prevalence and persistence of symptoms of anxiety and depression in 288 MI patients at 2-15 days following MI. The same patients were assessed again at 4 months and 12 months of initial diagnosis of MI. It was reported that 30.9% MI patients were identified with significant symptoms of depression and 26.1% were identified with anxiety during baseline assessment after 2-8 days of diagnosis of MI. The prevalence of symptoms of depression was increased up to 37.7% at 4 months and 37.2% after 12 months of diagnosis of MI. Similarly the prevalence of anxiety was 41.8 % at 4 months and 40.0% at 12 months. The results of this study supported the fact that considerable symptoms of anxiety and depression are present in MI patients over the period of one year. Doering et al. (2010) also reported significantly high persistent symptoms of depression and anxiety in patients with ischemic heart disease (IHD). In a prospective, longitudinal cohort study, 42.5% of IHD patients reported persistent symptoms of anxiety and 45.4% reported persistent symptoms of depression at 3 months follow up. It was also reported that persistent high symptoms of depression and anxiety were significantly associated with mortality. In a Finnish study of 85 consecutive post MI patients; the prevalence of

depression was estimated at 21% at baseline during hospitalization. It was increased to 30.0% at 6 months and reached to 33.9% at the end of the 18 month follow up period (Luutonen et al., 2002).

Yu et al. (2010) reported that Type D personality was significantly associated with psychological distress (depression & anxiety). Symptoms of anxiety and depression were examined between Type D and non-Type D patients. The analysis revealed a significant difference between Type D and non- Type D patients. Type D patients reported more symptoms of depression ($t = -2.46$, $p = .016$) and anxiety ($t = -3.72$, $p = .002$) as compared to non-Type patients. The findings supported the association of Type D personality with increased symptoms of anxiety and depression in Chinese CHD patients.

Although there are significant cultural differences between Pakistan and other countries, the findings of current study validated the previous research evidence on the relationship between Type D personality characteristics and elevated levels of anxiety and depression in cardiac patients. This reflects similarities in the patterns of association between personality and other psychosocial variables (anxiety, depression) across different cultures.

Keeping in view the high level of anxiety and depression in MI patients, reported in the current study, it is important to explore the reasons for such high levels of anxiety and depression among patients with MI in Pakistan. Multifarious physical, social and psychological factors are associated with such a high level of persistent symptoms of anxiety and depression in MI patients.

Psychological distress is common in patients diagnosed with life threatening disease such as MI. People go through a period of emotional turbulence characterized by denial, anger, sadness and anxiety. These are normal responses to traumatic events and usually subside within a week or two. However there are underlying vulnerability factor such as Type D personality which may predispose MI patients to psychological distress such as anxiety and depression. MI patients with Type D personality are more prone to anxiety and depressive episodes as compared to non-Type D patients. Depression and Type D personality signify complementary perspectives; however Type D personality is a stable construct, whereas episodes of depression may be transient. Type D personality characteristics such as negative affectivity and social isolation may act as underlying vulnerability factors that predispose MI patients to psychological distress (anxiety & depression). In the current study a significantly high percentage of the participants have been identified with Type D personality characteristics. Therefore Type D personality may be an underlying factor associated with such high level of anxiety and depression among MI patients.

As well as Type D personality, other sociodemographic and psychosocial factors may also have contributed to such elevated levels of anxiety and depression in the current sample of MI patients. For example, the overall instable political and economic condition of Pakistan may have affected every individual in the country.These conditions have led to inflation and an increase in unemployment. The state provides limited free health care facilities in terms of treatment and management of cardiac diseases. In the current study the majority of the participants belonged to lower and middle income groups, therefore the

perceived physical disability and associated apprehensions about increased healthcare and treatment costs may be associated with high levels of anxiety and depression in the present sample. Similarly other life crisis and ongoing stressors may exacerbate the symptoms of anxiety and depression in patients diagnosed with MI. Other factors prevailing in the country such as inflation, lawlessness, violence and terrorism for the last decade have increased the vulnerability for psychological distress in the general population (Khan et al., 2012; Husain, 2014; Kidwai, 2014). All these factors may further increase the vulnerability among individuals with MI and reduce their ability to cope with life threatening disease (MI) along with other stressors.

In the current research, no significant gender differences were identified in symptoms of anxiety and depression in patients with MI. This result is validated by other research studies conducted in Pakistan on MI patients. Bashir (2009) reported no significant differences between male and female participants of the study in terms of anxiety (t= .42 *p*= .67.) and depression (t= .61 *p*= .55) following MI. Assad (2004) also found no significant gender differences in symptoms of anxiety (t=0.74; p= 0.40) and depression (t=0.99; p=0.32) in MI patients.

The findings of the present research are further substantiated by previously published research evidence from other countries. Yu et al. (2010) also measured the gender difference between males and females in the levels of anxiety and depression among Chinese patients with CHD. No gender difference was found in the levels of anxiety (p=0.36) and depression (p=0.41) in these patients. Ladwig et al. (2000) also found no significant gender differences in the prevalence of depressive symptoms). Mallik et al. (2006) showed that

symptoms of anxiety and depression are equally experienced by MI patients with progressing age, irrespective of gender**.**

However, contradictory to our findings, some studies reported that more female as compared to male MI patients are identified with elevated levels of anxiety and depression. Hafizullah et al. (2011) reported significant gender differences in symptoms of depression between male and female patients with AMI. Analysis revealed that 86.5% of female patients reported significant symptoms of depression as compared to 72.2% of male patients ($p< 0.02$) based on HADS scores.

Other studies have also shown that the level of both anxiety and depressive symptoms was higher in females as compared to males (Samad et al., 2002). Bokhari et al. (2002) also reported the prevalence of depression was 31.0% in males and 54.0% in female CAD patients. Gul & Bhatti Ali (2009) reported that females exhibited more Type D personality traits, elevated levels of anxiety/depression and more impairment in quality of life as compared to male MI patients. The impaired quality of life in females may be attributed to the fact that the prevalence of Type D personality characteristics, anxiety and depressive symptoms was also higher in females which may have affected the QOL of female MI patients. Furthermore, it was reported that females with cardiac disease exhibited high level of anxiety and depressive symptoms and significantly lower quality of life as compared to males over a 12-month longitudinal follow-up (Emery et al., 2004).These inconsistent findings warrant

further research on gender differences in terms of Type D characteristics, anxiety, depression, social support and quality of life in MI patients.

6.5 Assessment of Social Support (time1 & time2)

This section of the discussion focuses on the assessment of social support in patients with myocardial infarction (MI) at time 1 and time 2 assessments. The differences in the levels of social support between time 1 and time 2 are also discussed here.

The results have shown that a majority of participants scored at low level of social support both time 1 and 2 assessments (table 5-40 & 5-41). It can thus be inferred that for the analysis, that social support has been persistently low which can explain the increase in levels of anxiety, depression and impairment in overall quality of life. When compared to the findings from other follow-up studies, it is evident that appropriate treatment and management results in an increased social support which is a significant mediator towards improved quality of life and can decrease in symptoms of anxiety and depression. Research work of Pederson et al. (2004) has shown that low social support is an indicator of poor quality of life in cardiac patients (Pedersen et al., 2004).

In the present research a significant relationship was found in Type D personality and social support. MI patients with Type D personality reported low level of social support. These findings are supported by Sararoudi et al. (2011) who illustrated that MI patients with Type D personality perceive low level of social support from social network such as significant others and friends as

compared to non-Type D patients. The authors (Sararoudi et al., 2011) concluded that Type D personality traits have significant impact on the perception of social support in patients post MI. Type D individuals have the tendency to experience negative emotions and to inhibit their emotions, as a results they feel inhibited in seeking social support from their social network and perceive low level of social support. Along with low social support and Type D personality, these individuals are predisposed to psychological distress. This suggests possible role of personality traits in appraisal of social support and experiencing psychological distress (i.e., anxiety and depression) and consequently quality of life following myocardial infarction. Ginting et al. (2014) established that individuals with Type D personality reported unhealthy behaviors and low level of perceived social support.

Social support is an important factor particularly in Pakistani culture where families usually live in joint family system, however considering the findings of the study, there is need to understand the dynamics of social support and whether appropriate and adequate support is accessible to individuals particularly with Type D personality, who are more prone to non-compliance with the treatments and interventions.

6.6 Relationship of sociodemographic and clinical variables with QOL at time 1 and time 2

The following section is related to the correlation analysis between predictors and outcome variable (quality of life) at baseline after 2-8 weeks of diagnosis of

MI and 9 months follow up. Among sociodemographic variables, family monthly income had significant relationship with all the domains (physical, psychological, social and environmental) of quality of life both at time 1(table 5-23) and time 2 (table 5-26) assessments.This indicated that participants with low monthly income have impaired quality of life. Similarly education was significantly associated with physical, psychological, social and environmental quality of life at time 1 assessment. Marital status also had significant negative relationship with physical, psychological and social quality of life, which indicated that single patients had impaired quality of life.

Correlation analysis of clinical variables showed that MI disease severity was significantly (negative) associated at <0.01 level with physical, psychological, social and environmental quality of life both at time 1 (table 5-24) and time 2 (table 5-27) assessments. These results indicated that the higher the severity level of MI, more impaired would be the quality of life and vice versa. Smoking status had a significant relationship with social quality of life at time 1 assessment and significant association with physical, social and environmental quality of life during time 2. Comorbid physical diseases were found to be significantly associated with physical, social and environmental quality of life at time 1 assessment. However no significant correlation was found between comorbid physical diseases and all the domains of quality of life (physical, psychological, social & environmental) at time 2 assessment.

Variables such as family monthly income and education are indicators of socioeconomic status (SES).The significant association of SES and marital

status with all the domains of quality of life in the current study is understandable in the light of following research evidence.

Studies have shown that SES is an important factor associated with quality of life in cardiac patients (Lacey & Walters, 2003; Sekar et al., 2008). Denvir et al. (2006) found that SES is significantly associated with health related quality of life (HRQOL). The results showed that lower SES is associated with impaired quality of life both at baseline and 12 months follow up in patients with percutaneous coronary intervention (PCI). Mielck et al. (2014) in their study on socioeconomic status (SES) and health related quality of life in adults with chronic diseases highlighted the importance of SES in heart disease. It was reported that people belonging to lower socioeconomic strata are more prone to chronic disease due to increased levels of health impairments caused by economic deprivation. The impairment in health related quality of life after the disease would further increase the financial burden on these patients.

Hoe et al., (2014) in a cross-sectional correlational study identified a significant relationship between marital status and quality of life of patients with heart failure. It was reported that patients who were married or had a partner, had better HRQOL as compared to patients who were single.

Another study on HRQOL after a myocardial infarction in a total sample of 2950 reported a significant impact of demographic and clinical variables on HRQOL (Schweikert et al., 2009). In demographic variables, low level of education and in clinical variables, smoking and comorbidity (diabetes), were identified as some of the significant predictors of impaired HRQOL following MI. Wang et al. (2012)

also reported a significant relationship of smoking and hypertension (comorbidity) with physical quality of life in Chinese patients. Results of correlation analysis between clinical variables and quality of life in the current research are also consistent with William's (2007) study which showed that levels of disease severity has significant negative correlation (-.207**) with quality of life indicating that patients with more impairment in level of disease severity(LVEF) have poor quality of life .

6.7 Relationship between psychosocial variables and quality of life at time 1 and time 2

This section pertains to the correlation analysis between psychosocial predictors (Type D personality, anxiety & social support) with quality of life in patients post MI.

The correlation analysis between psychosocial variables and all the domains (physical, psychological, social & environmental) quality of life showed significant relationships both at time 1(table 5-25) and time 2(table5-28) assessments. The analysis revealed that significant negative correlation exists between Type D personality, anxiety, depression and all the domains (physical, psychological, social & environmental) quality of life. This indicated that MI patients with Type D personality characteristics and a high level of anxiety and depression have more impaired quality of life in all the domains of quality of life. At time 1 assessment, the most significant association of Type D personality

(r (298) = -0.62, p < 0.001), anxiety (r (298) = -0.55, p < 0.001) and depression(r (298) = -0.70, p < 0.001) was found with psychological quality of life. Similarly at time 2 assessment, significant (negative) relationship was found between Type D personality, anxiety, depression and all the domains of quality of life. The most significant negative and high correlations were found between depression and physical, psychological, social and environmental quality of life at p<0.01 level (table 5-28).These results showed that MI patients with high levels of depression had significant impairment in all domains of quality of life and vice versa.

Social support was positively correlated with physical, psychological, social and environmental quality of life both at time 1 and time 2 assessments. These findings substantiated that patients with low level of social support have poor quality of life.

The psychosocial variables (Type D personality, anxiety, depression & social support) were also significantly associated with each other. The most significant positive correlation was found between Type D personality and depression both at time 1 (r (298) = 0.68, p < 0.001) and time 2 *(r (189)* = 0.65, *p* < 0.001) assessments. Similarly depression was positively associated with anxiety at time 1((r (298) = 0.69, p < 0.001) and time 2 *(r (189)* = 0.60, *p* < 0.001) assessments. Social support was also significantly associated with Type D personality, anxiety and depression at time 1and time 2 assessments.

The findings of the current study are supported by various research studies conducted in Pakistan which have shown a significant relationship between

Type D personality, anxiety, depression, social support and quality of life in MI patients.The results of the current research was also supported by a prospective study (Menon & Ramamurthy, 2012) conducted in south India on 60 consecutive patients hospitalized for MI. A significant correlation was found between anxiety and depression($r=0.501$, $p<0.001$) at baseline and at 12 months follow up($r=0.718$, $p<0.001$).

The results of the current study are also in line with Volz et al. (2011) study, which reported significant correlations between psychosocial variables at baseline with physical and emotional dimensions of quality of life at follow up. Depression (r= 0.39**) anxiety (r= 0.49**) Type D personality (r= 0.21*) and social support (r=- 0.32**) significantly correlated with physical dimension of health related quality of life. Similarly the emotional dimension of health related quality of life had significant correlation with depression (r= 0.50**), anxiety (r= 0.52**) Type D personality (r= 0.29**) and social support. Williams (2007) also reported a significant relationship between psychosocial predictors and quality of life at baseline within 3-7 days of diagnosis of MI (time 1) and 3months follow up (time 2) assessments. According to Williams (2007), Type D personality was significantly associated with depression (r=.665**) and anxiety (r=.704**) at time 1 assessment. Type D personality also had positive correlation with depression(r=.553**) and anxiety(r=.533**) at time 2 assessment. This indicated that patients with Type D personality experience more symptoms of anxiety and depression as compared to non-Type D MI patients during baseline and 3 months follow up. Depression and anxiety was significantly associated with each

other and with quality of life both at time 1 and time 2 assessments. Type D was also significantly associated with quality of life (r=.952**).

In the current study, a significantly high percentage (51.7%) of MI patients was identified with Type D personality. Consistent with the above research evidence, and the results of the current study, it is evident that Type D individuals would be more prone to experience high symptoms of anxiety and depression and low level of social support. All these factors are significantly associated with adverse effects on all the domains of quality of life post MI even after 9 months follow up.

6.8 Psychosocial predictors of Quality of life at time 1 and time 2

This section of the discussion pertains to the assessment of significant psychosocial determinants of quality of life. The results for hierarchical regression analysis of all the four domains (physical, psychological, social & environmental QOL) of quality of life are discussed in this section. The following table (6.1) gives the summary of most significant predictors of physical, psychological, social and environmental quality of life in the final models at time 1 and time 2 assessments.

Table 6-1: Summary of predictors of quality of life in MI patients

	Time 1			
	Physical QOL	**Psychological QOL**	**Social QOL**	**Environmental QOL**
Predictors				
Sociodemographic	Marital status	------	------	Family monthly income
Clinical	MI Severity	------	------	------
Psychosocial	Social support	Type D personality Depression	Type D personality	Type D personality, Anxiety, Social support
	Time 2			
	Physical QOL	**Psychological QOL**	**Social QOL**	**Environmental QOL**
Predictors				
Sociodemographic	------	------	------	------
Clinical	------	------	Smoking status	Smoking status
Psychosocial	Social support Depression	Depression	Type D personality Depression, Anxiety	Type D personality Depression, Social support

6.9 Predictors of physical quality of life at time 1 and time 2

The physical quality of life as assessed by WHOQOL – BREF (WHOQOL Group, 1998) subscale (physical domain) measures the physical functioning of participants, including their involvement in activities of daily life, levels of their

energy or fatigue, pain and discomfort, sleep and rest, the ability to move and work normally, and the level of their dependence on medicine and other related medical aids. In the current study, the results from hierarchical regression analysis suggested that overall the variance in physical quality of life is explained by sociodemographic, clinical and psychosocial variables.

During time 1 assessment, variables such as marital status, family monthly income, MI disease (higher impairment of LVEF) severity, Type D personality and social support all contributed to increase in variance in physical quality of life. However in the final model, the most significant predictor was found to be marital status among sociodemographic variables and MI disease (higher impairment of LVEF) severity in clinical variables. Whereas, social support was identified as the most significant psychosocial predictor of physical quality of life. The final model showed that 56.0% of the variance in physical quality of life was explained by these variables after controlling other sociodemographic and clinical variables. Therefore MI patients, who were single (unmarried, widow/widower, divorced), had high impairment in disease severity (higher level of impairment of LVEF) and low level of social support had more impaired physical quality of life(table 5-29).

During time 2 assessment, family monthly income, MI disease (higher impairment of LVEF) severity and smoking status were identified as significant predictors of physical quality of life in the initial models. Type D was also identified as a significant predictor and increased the variance up to 49.0% at

step 3. However in the final model depression and social support were identified as the most significant predictors of physical quality of life increasing the variance up to 71.0% at time 2 assessment (table 5-33). The physical quality of life of participants was more impaired at time 2 assessments as compared to time 1 assessment (table 5-42).

In the current research, MI disease severity was identified as one of the most significant predictors of physical quality of life at time 1 assessment. These findings are consistent with the results from William's (2007) research which showed MI disease severity was one of the significant predictors of physical quality of life along with other psychosocial (anxiety & illness perception) variables.

A study by Beck et al. (2001) also investigated the significant predictors of quality of life at 6 months and 1 year after the diagnosis of acute myocardial infarction (AMI) in a prospective cohort study. In a total sample of 554 participants recruited at baseline, 480 were assessed at 6 months and 491 at 1 year in a prospective cohort study. Depression was identified as a significant predictor of physical, mental and overall quality life at baseline, 6 months and 1 year follow up assessment. The results of current study were also supported by Brink et al. (2005). They investigated the change in health related quality of life (HRQOL) over the period of 1 year after first time acute myocardial infarction. The findings suggested that depression and fatigue were most significant predictors of impaired quality of life for both men and women at 1 year follow up.

Early screening of depression and fatigue was suggested in first time diagnosed patients of MI to minimize the impact of these variables on quality of life.

The results from the present study are further supported by a recent research study (Heo et al., 2014) on types of social support and its association with physical symptoms, depressive symptoms and health related quality of life (HRQOL) in patients with Heart failure (HF). In this cross-sectional study social support was measured in terms of marital status, social networks, emotional support, instrumental support, relationships with family and health care provider in the sample of 71 patients with HF. Marital status and emotional support was significantly associated with physical symptoms and HRQOL in bivariate analysis. These results suggested that patients who were in a marital relationship, and perceive high level of emotional support, experience less severe physical symptoms related to HF and better HRQOL. However in multivariate analysis the relationship of marital status and emotional support with HRQOL was mediated by physical symptoms and depressive symptoms.

During the baseline assessment after 2-8 weeks of diagnosis of MI, the significant relationship of marital status, MI severity and social support with physical quality of life is understandable. Most of the areas assessed under physical quality are likely to be effected by the presence or absence of these factors. High level of diseases severity may contribute to difficulty in daily activities, pain, lack of energy, fatigue, sleeplessness and the capacity to work would be decreased in cases of high severity of myocardial infarction. Similarly

the presence or absence of social support may have a strong impact on all these factors. Presence of a spouse /martial partner is a major source of social support for patients suffering from myocardial infarction and therefore both social support and marital status appeared as significant predictors of physical quality of life. Also the data for time 1 of the study was collected within 2-8 weeks of diagnosis, and outcomes of myocardial infarction for newly diagnosed patients are extremely traumatizing and significant impact on physical quality of life. Furthermore the physical quality of life is more deteriorated in case of high severity of illness and absence of social support. However during time 2 assessment depression and social support were identified as the most significant predictors of physical quality of life. Since, in the present study, patients perceived low level of social support and considerable increase in symptoms of depression even at time 2 assessment. All these factors had an adverse effect on the physical quality of life.

Another study (Staniute, et al., 2013) reported that perceived social support has an independent and significant effect on the both physical and psychological domains of health related quality of life in heart patients. The authors suggested that special focus should be given in rehabilitation program to address the health care needs of patients who experience high levels of stress and have low social support. A study (Pedersen et al., 2002) explored the relationship of social support with satisfaction and distress as experienced by patients following their first MI. Results showed that patients with low social support were more vulnerable to experience distress as compared to patients who perceived better

social support. The findings of this study also highlighted the role of some personality variables like Neuroticism on perceived social support. Its presence increased the vulnerability for high levels of distress in MI patients.

Since Type D individuals are less likely to adhere to medications (William et al., 2011) and follow doctor's recommendation related to life style changes (Gilmour & William, 2012) this may subsequently affect their quality of life.

6.10 Predictors of psychological quality of life at time 1 and time 2

The significant predictors of psychological quality of life both at time 1 and time 2 assessments are discussed in this section.

The psychological quality of life as assessed by subscale (Psychological Domain) of WHOQOL-BREF scale measures different aspects of psychological functioning of participants. These include bodily image and appearance, negative and positive feelings, self-esteem, spirituality, religion and personal beliefs. Besides this, items of the psychological domain also evaluate a person's cognitive functioning i.e. thinking, learning, memory and concentration (WHOQOL Group, 1998).

At time 1 assessment, the results from hierarchal regression analysis suggested that overall the variance in the psychological quality of life is explained by socio-demographic, clinical and psycho-social variables. The most significant predictors of psychological quality of life were marital status and family monthly income among the socio-demographic variables. In clinical variables, MI severity appeared as the most significant predictor. After controlling for demographic and

clinical variables the final model showed that depression and Type D personality were the most significant predictors for psychological quality of life and 61.0% of the variance was explained by these two psychosocial predictors (table 5-30).

At time 2 assessment sociodemographic variables such as age and family monthly income accounted for only 10% of the variance in psychological quality of life. In clinical variables MI disease severity was the most significant predictor. Type D was entered at step 3 and increased the variance up to 50.0 %. Type D was identified as a significant predictor after controlling for sociodemographic and clinical variables. However in the final model only depression was identified as most significant predictor, increasing the variance up to 75.0 % in psychological quality of life at time 2 assessment (table 5-34). The psychological quality of life of participants was more impaired at time 2 assessment compared to time 1 assessment (table 5-42).

These findings strongly suggested that Type D personality and depression have a role to play in determining the psychological quality of life of MI patients. This is consistent with some of the earlier research studies. For instance (Denollet et al., 2006) investigated the relative effect of stress and Type D personality on prognosis at 5-year follow-up of patients with coronary heart disease and found that Type D personality is an important psychological factor which increases the vulnerability for distress and poor health in patients with heart diseases. William (2007) reported the prevalence of Type D personality in cardiac patients was 33.9% and Type D was identified as a significant predictor of poor quality of life after controlling for mood, demographic and clinical variables.

Moreover, in other research, Type D patients (coronary artery bypass grafting) were found twice as likely to have poor physical HRQOL and more than five times as likely to have impaired mental HRQOL as that of the patients without Type D personality over the period of one year (Al-Ruzzeh et al.,2005). Bunevicinte et al.(2013) also identified symptoms of depression and certain personality characteristics (emotional stability) as independent predictors of HRQOL in CAD patients. It was suggested that personality characteristics along with symptoms of anxiety and depression should be taken into account while devising therapeutic interventions for the management and treatment of CAD patients.

Various cross-sectional studies (Naseer,2007; Gul & Bhatti Ali, 2009) conducted in Pakistan also identified Type D personality as an independent determinant of impaired quality of life. Doger et al. (2008) assessed different domains of quality of life with the WHOQOL-BREF scale in cardiac patients. Symptoms of depression were found to be the significant determinant of impairment of all the domains (physical, psychological, social & environmental) of quality of life.

Although studies from the West have identified Type D personality as an important determinant of health related quality of life in MI patients, this is the first cohort study in Pakistan which investigated the role of Type D personality on quality of life of patients with heart disease. At the same time the overall proportion of participants who were identified as having Type D personality was

high in this study sample. This is an important observation which requires the attention of healthcare providers as well as mental health professionals as high percentages of patients with Type D personality are more vulnerable to have a poor prognosis as evidenced by (Denollet et al., 2006) after a five-year follow-up of patients with coronary heart disease and (Pedersen et al., 2006) in a seven-year follow up of cardiac patients. Also, Type D personality has been identified as a stable construct (Martens et al., 2007) which is less likely to be influenced by other clinical variables thus highlighting different intervention needs in order to enhance the secondary prevention of cardiac disease in these patients. The risk of depression increases in patients with Type D personality. The WHO psychological quality of scale assess some of the important areas of person's psychological functioning i.e. positive and negative emotions, self- esteem, spirituality, religion and personal beliefs. The findings of this study, in this context are well-justified as people with Type D personality have a tendency to experience negative affectivity thus are at increased risk to develop a depressive disorder which is characterized with low self-esteem and inappropriate (negative) spiritual, religious and personal beliefs. The psychological quality of life domain on this measure also assessed the thinking, memory, and concentration of participants which is likely to be hampered due to depression. Besides, in the context of Pakistani culture, the deteriorating social, political and economic conditions of the country for the past few years have resulted in poor social stability. Rising rates of violence and terror in a society, unemployment, poor living conditions exacerbate the risk for poor psychological quality of life. These conditions increase the vulnerability of people with Type D

personality to suffer from depression and poor prognosis in case of heart disease even at 9 months follow up depression emerged as the most significant and independent predictor of psychological quality of life.

6.11 Predictors of social quality of life at time 1 and time 2 assessments

The significant predictors related to social quality of life are discussed in this section.

Social quality of life is an important dimension in cardiac care and has special value in predicting the need for further hospitalization and treatment outcomes among cardiac patients. It is valuable to identify some of the predictors for social quality of life which will facilitate addressing the treatment needs of patients. Social quality of life as assessed by WHOQOL- BREF scale involves personal relationships, social support and sexual life (WHOQOL Group, 1998).

The findings from regression analysis revealed that marital status and family monthly income were the most significant predictors among socio-demographic variables in the first step. This is understandable as marital status has an important role to play in determining the nature and quality of personal relationships, social support as well as sexual life of respondents in the context of Pakistani culture. It is important to note that, family monthly income remained significant along with two clinical variables i.e. MI disease severity and smoking status at the second step. At this level, sexual life also appeared as one of the important predictors for social quality of life. This nature of relationship between variables is best explained by the fact that in Pakistani culture, sex (whether male of female) is associated with all other three significant predictors i.e. family

monthly income, smoking status and disease severity. Males are the sole earners in some families thus the health conditions of male family members are likely to impact family monthly income. Male participants are more likely to engage in smoking which is also related with disease severity. In the current study 55.1% (86/156) male participants were current smokers as compared to 13.9 % (20/144) female participants.

The hierarchal regression analysis showed that after controlling for all other factors Type D personality emerged as the most powerful predictor of social quality of life and accounted for 55.0% of the variance in the final model during time 1 assessment (table 5-31).

Again at time 2 assessment family monthly income appeared as the most significant sociodemographic, and MI disease severity and smoking status emerged as significant clinical predictors of social quality of life. Psychosocial predictors were entered in the last step and the final model accounted for 68.0% of the variance. In the final model, smoking status, Type D personality, anxiety and depression were identified as most significant predictors of social quality of life (table 5.35). There was no significant difference in social quality of life between time 1 and time 2 assessments (table 5-40 & 5-41).

These findings are consistent with other studies. Gul & Bhatti Ali (2009) reported Type D personality as a significant predictor of impairment in social quality of life of patients with MI. Saeed et al (2011) investigated the impact of Type D

personality on quality of life in a Pakistani sample of MI patients and healthy controls. The results revealed that quality of life of MI patients was more impaired as compared to their control group. Moreover, Type D personality was identified as a significant determinant of quality of life of patients post MI. Denollet et al. (2000) also identified smoking, Type D personality and depression as independent predictors of impaired quality of life of patients with CAD. Kupper et al. (2013), in a cross-cultural study of 6222 patients with IHD, linked smoking , sedentary patterns of life styles, comorbidity (hypertension) and depression with Type D personality. All these factors have a detrimental impact on quality of life (Denollet et al., 2000). Schweikert et al.(2009) argued that there was considerable reduction in HRQOL of patients after MI as compared to the general population. Smoking was identified as one of the significant predictors of impaired HRQOL along with other clinical and demographic variables with major impact in the domains of anxiety and depression.

Pedersen & Denollet (2003) conducted a comprehensive review to explore whether Type D personality is an important determinant of distress as a coronary risk factor and found that cardiac patients with Type D personality are usually at increased risk to develop other physical and psychological health problems. These patients are also less likely to benefit from available treatments and have overall poor quality of life. On the basis of this review, the authors suggested that a personality approach should be incorporated to address the special health-care need of patients (Pedersen & Denollet, 2003). Furthermore, negative affectivity and social inhibition are important features of

Type D personality, which can also influence the social quality of life of patients. The relationship of Type D personality with poor social quality of life is plausible since Type D personality have been found to influence the perceived social support related to of personal relationships such as family , friends and significant others (Sararoudi et al., 2011).

Schoormans et al, (2012) also found that congenital heart defect patients who have Type D personality feel functionally more impaired and had poor quality of life. The findings of the present study provides further validation about the nature of relationship of Type D personality with social quality of life in cardiac patients as earlier research also demonstrated that these patients face problems in communication and suffer in silence due to social inhibition (Schiffer et al, 2007). Williams (2007) reported that Type D personality has more adverse impact on social quality of life because Type D patients believed that their disease would have more serious and long term implications.

6.12 **Predictors of environmental quality of life at time 1 and time 2**

The environmental quality of life is also one of the most important aspects of quality of life. The environmental quality of life subscale on WHOQOL_BREF questionnaire provides in-depth information about financial resources, freedom, physical safety, security, health and social care of participants. It also assess the nature of home environment, opportunities for acquiring new information and skills, participation in and opportunities for recreation / leisure activities and the

physical environment (pollution / noise / traffic / climate) and use of transport (WHOQOL Group, 1998).

Among demographic variables the most important predictor was family monthly income which remained significant even controlling for all other variables at the final level during time 1 assessment.

Family monthly income is one of the indicators of socioeconomic status. In the current study, the relationship of family monthly income with environmental quality of life is well-justified as most of the aspects of environmental quality of life (financial resources, physical safety, security, health and social care, opportunities for recreation and leisure activities) are strongly influenced by family monthly income of any Pakistani family.

Research evidence has shown that patients belonging to lower SES have significant impairment in physical and mental health functioning. Socioeconomic status has considerable impact on HRQOL of patients with CAD (Sacker et al., 2008) and patients having CABG surgery (Le-Grande et al., 2006). Other studies did not find significant association between impaired HRQOL and socioeconomic positions in patients with heart attack (Stafford et al., 2011).

A number of complex clinical, behavioral and psychosocial factors may contribute towards the mediating role of socioeconomic status (SES) in the aetiology and prognosis of myocardial infarction. People belonging to lower SES are more prone to behavioral and psychosocial risk factors such as smoking, unhealthy life styles, economical and psychosocial stressors etc (Lynch et al., 1996; Marmot et al., 2001; Alter & Iron 2004). All these factors exacerbate the

disease severity, contribute to adverse outcomes following MI and have deleterious impact on the prognosis post MI. Other factors such as difficulty in access to appropriate healthcare, adherence to medications, modification in life styles, non- compliance to treatment regime and vulnerability to psychosocial stressors are more common in patients from lower SES following an MI (Alter & Iron 2004; Fiscella & Tancredi , 2008).

Besides family monthly income, social support, anxiety and Type D personality were also identified as most significant predictors in the final model which accounted for 52.0 % of the variance in environmental quality of life at time 1 assessment (table 5-32)

These findings are well-justified in the context of the construct of environmental quality of life as well as being consistent with previous research findings. Social support has been repeatedly identified as one of the most important predictors of quality of life in patients with cardiac diseases (Banett et al., 2001; Hoe et al., 2012; Arestedt et al., 2013). The relationship of Type D with health related quality of life has been reported in patients with different kind of heart disease like coronary artery disease (Denollet &, Brutsaert, 2000), chronic heart failure (Schiffer et al., 2005) and heart transplant recipients (Pedersen et al., 2006).

The explanations offered for the findings showing a significant relationship of Type D personality with environmental quality of life in the present study are rational. People with Type D personality have been found to be high on negative affectivity and social inhibition and some of the areas related to environmental quality of life i.e. participation in recreational and leisure activities might demand social activity as well as positive affectivity. Also the final model

revealed that anxiety is one of the significant predictor for environmental quality of life. Research evidence has demonstrated that a higher level of anxiety is an important determinant of adverse impact on health related quality of life and physical activity (De Jong et al., 2005) in patients with Heart failure. Volz et al. (2011) also reported anxiety as one of the most significant predictor of impaired health related quality of life (Volz et al., 2011) in patients with CHF. Lane (2000) also reported the significant impact of anxiety and depression on quality of life in MI patients after 4 months follow up.

The possible reason for this is that people with Type D personality are high on negative affectivity and social inhibition which may increase their risk of developing anxiety. Individuals who tend to inhibit their emotions are more prone to developing anxiety (Rupee, 2000). Schiffer et al. (2008) demonstrated that Type D personality is a significant predictor of anxiety at 1 year follow up in patients with heart failure. Research evidence has demonstrated that a higher level of anxiety is an important determinant of adverse impact on health related quality of life and physical activity (De Jong et al., 2005) in patients with HF.

During time 2 assessment, family monthly income, MI disease severity and smoking status contributed to an increase in variance of environmental quality of life in the initial models. Introduction of psychosocial variables accounted for a 64.0% increase in the variance of environmental quality of life. In the final model smoking status, Type D personality, social support and depression were identified as the most significant predictors of environmental quality of life after controlling for sociodemographic and clinical variables (table 5-36).

The association of smoking status, Type D personality, anxiety, depression and lack of social support are interlinked in predicting impairment in environmental quality of life post MI. Type D individuals are more likely to engage in unhealthy behaviour practices such as smoking (Gilmour & Williams, 2012).Type D personality is associated with low level of social support (Sararoudi et al., 2011) and an elevated levels of depression (Pedersen et al., 2006; Martens et al., 2008 , Spindler et al., 2009) and anxiety (Spindler et al., 2007; Van Gastel et al., 2007 ; Schiffer et al., 2008) which would result in impaired quality of life.

Van den Broek (2009) discussed that Type D cardiac patients without partners have higher risk of developing symptoms of anxiety and depression as compared to Type D patients with a partner. It was concluded that Type D patients without a partner would be more distressed and would be less likely to change unhealthy behaviour patterns.

An important aspect of dealing with heart disease is having a good social support network. You have to have some connectedness to deal with heart disease both physically and emotionally. Whether it's the initial phase of dealing with the shock of diagnosis with a life threatening disease or recovery from MI, social support play a crucial role at every stage of heart disease. Phases such as adherence to medication (Dimatteo & Robin, 2004; Williams et al., 2011), modification in life styles, engaging in exercise, participation in cardiac rehabilitation programs (Shen et al., 2004), and dealing with psychological distress (Frasure Smith, 2000; Vinod & Christopher,2014) involves social support Therefore quality of life of patients may improve by increasing their social support (Barutcu et al., 2013).

In the present research, depression was identified as the most significant predictor of impaired quality of life in all the four domains (physical, psychological, social & environmental) at time 2 assessment. There was considerable increase in the percentage of depression at follow up (table 5.11). The quality of life of patients was also more impaired in physical, psychological and environmental domains at time 2 assessment as compared to time 1 assessment (table 5-42). Therefore elevated levels of depression at time 2 may have contributed to increased impairment in quality of life. Along with depression the persistent levels of Type D personality characteristics and higher level of anxiety are also associated with adverse quality of life at time 2. Social support was also identified as one of the most significant predictor of physical and environmental quality of life both at time 1 and time 2.

In the present study, considerable numbers of patients were already identified with Type D personality, high levels of anxiety, depression and low level of social support at baseline assessment. In addition to this, various life stressors such as financial crisis, family stressors, lack of access to adequate medical treatment may have exacerbated the symptoms of anxiety and depression which would ultimately have a negative prognostic impact on quality of life. In Pakistan, treatment of MI patients is primarily based on medication, and there is lack of attention to appropriate psychosocial interventions in cardiac rehabilitation program. These patients did not receive appropriate psychosocial therapeutic interventions along with medications. Therefore they continue to experience high

level of distress (anxiety, depression), lack of social support and more impaired quality at 9 months post MI.

6.13 Strength and Limitations of the study

The following section of discussion presents the significant strengths and limitations of the current study.

6.13.1 Strengths

Some of the significant strengths of the current study are as follows:

This is the first prospective cohort study carried out on MI patients in Pakistan with a reasonable sample size and multiple psychosocial variables such as Type D personality, anxiety, depression, social support and quality of life. MI patients were evaluated at 2 points in time; at 2-8 weeks of diagnosis of MI and 9 months follow up. Assessment of psychosocial variables at 2 points in time is strength in measuring the relationship, stability or change in different variables.

The instruments selected in this study to assess psychosocial variables (Type D personality, anxiety, depression & social support) and quality of life, are cross-culturally measures with established validity and reliability. Specific tools such as the HADS, Distress scale-14 and WHOQOL scale adds strength to the study. The questionnaires were brief, written in simple language and easy to administer. In addition, these instruments had been previously validated within the sample of MI patients in Pakistan (Hafizullah et al., 2011; Gul & Bhatti Ali, 2009; Bashir, 2009; Dogar et al., 2008; Naseer , 2007; Khan, 2004).

Cardiovascular disease is a pervasive problem in Asian communities. Although the study was done in Pakistan findings can be transferred to other Asian communities, including those living in the West, to replicate and also carry out psychological interventions. Finding ways of modifying key personality traits and helping people manage their health better will reduce the huge burden on health services to provide care. In Britain this is a huge service need among south Asian/Pakistani people. Research evidence (Nazroo, 2001) has shown that Pakistani and Bangladeshi people had significantly higher rates of Ischemic heart disease as compared to white people and other south Asians such as Indians. Socioeconomic status (SES) was identified as one of the most important contributors of poor health and chronic diseases among Pakistanis living in UK (Nazroo, 1997; Nazroo, 2003). Even in south Asians, Muslims are more prone to coronary heart disease as compared to other South Asians religious groups (Williams, 2010). Ali (2011), in his study on psychosocial predictors of health related quality of life in south Asian patients (29%) living in UK, reported significant symptoms of depression in patients after an acute coronary syndrome.

In this context the findings of this study can be used to develop rehabilitation programs for psychological interventions to be built into post heart attack care.

6.13.2 Limitations

It is essential to consider the following limitations of the current study. In the current study only first time diagnosed MI patients were recruited. They were recruited from outpatients department within 2-8 weeks of diagnosis of MI.

Hospitalized MI patients with severe infarction were not recruited in the current study. Therefore the results cannot be generalized to hospitalized MI patients and the sample may not be the representative of MI patients in general.

In the present research, the sample was limited to only one specific group of MI patients. Patients with other CHD conditions were not included in the study.

For the last 2 decades Pakistan has been exposed to adverse circumstances (terrorism, political instability, and the deterioration in every sphere of socioeconomic conditions) which may lead to an increase in Type D personality traits, anxiety and depression, not just in cardiac patients but in the general population as well. Therefore a control group of the general population should be included in future research.

The current study is only limited to one MI related disease outcome, that is quality of life. Other important disease related outcomes such as mortality and morbidity were not explored.

The present study relied on self-reporting instruments. The questionnaires were administered in face to face interviews by the researcher and assistants in a uniform manner. However, there is always the possibility of self-reporting bias while assessing psychosocial variables and quality of life. Relying only on self-reporting measures, without formal diagnostic criteria (ICD-10, DSM- 5) especially for depression and anxiety is one of the limitations of current study.

6.14 Significant contributions of the current research

This section of discussion describes the significant contributions of the present research and recommendations for future research**.**

The current study has added to the existing research on psychosocial predictors of adverse outcome such as impaired quality of life post MI especially with reference to the Pakistani population. The following are some of the significant contributions of this study in research on MI patients which has not been considered and extensively examined before in a Pakistani population.

First of all this research is the first prospective cohort study carried out in Pakistan to investigate the prognostic impact of psychosocial predictors on quality of life in MI patients. Psychosocial predictors (Type D personality, anxiety, depression & social support) and quality of life was assessed at time 1 and time 2 assessments. Several sociodemographic and psychosocial variables were examined for the first time in this group of MI patients including Type D personality, anxiety, depression & social support (perceived & received social support).

On the basis of the present research findings, it is concluded that significant levels of Type D personality characteristics were clearly exhibited by patients with myocardial infarction at baseline within 2-8 weeks of diagnosis of MI and 9 months follow up. Therefore the present research has established the significance of Type D personality as persistent and stable personality characteristics over the period of time (9 months) in the study in MI patients in

Pakistan. Contrary to the general assumptions about cross-cultural differences in patterns of behavior, Type D personality was identified as a global personality characteristic with fairly stable and consistent patterns of behaviour and emotions (Denollet 2012). The results of the present study reiterated the significant prevalence and stability of Type D in MI patients and its association with adverse outcomes across different cultures.

Significantly high levels of anxiety and depression was found to be experienced by MI patients both at baseline and follow up. In particular, MI patients characterized as Type D individuals reported higher levels of anxiety , depression and low level of social support as compared to non-Type D patients both at baseline (time1) and 9 months follow up (time 2) assessments. Another significant finding of this research is that psychological distress (anxiety & depression) post MI and its relationship with Type D personality was prospectively identified for the first time in Pakistan.

Sociodemographic (marital status, family monthly income) clinical (disease severity, smoking status) and psychosocial variables (Type D personality, anxiety, depression & social support) were identified as a significant determinant of Post MI quality of life (physical, psychological, social & environmental QOL) at baseline and 9 months follow up. The research has identified quality of life (physical, psychological, social & environmental QOL) as an important outcome in cardiovascular research in Pakistan. The study also highlighted the

assumptions that certain psychosocial predictors are associated with a particular domain of overall quality of life.

The study identified for the first time that personality factors (Type D personality) play a significant role in predicting quality of life in a Pakistani population of MI patients.

In the current study Type D was identified as a significant predictor of psychological, social, and environmental domains of quality of life at time 1(baseline) and social , environmental quality of life at time 2 (9 months follow up) assessment . Anxiety appeared as a significant predictor of environmental quality of life during time 1 assessment and social quality of life in time 2 assessment. Depression emerged as a significant predictor of psychological quality of life at time1assessment at baseline. However, at 9 months follow up after controlling for sociodemographic and clinical variables, depression was identified as the most significant predictor of all the four domains of quality of life (physical, psychological, social & environmental QOL). Therefore for the first time in cardiovascular research in Pakistan, the importance of depression was established as one of the most significant determinant of quality of life (baseline & 9 months follow up) after controlling for sociodemographic and clinical variables.

Further, it appears that social support was established for the first time as a significant psychosocial variable associated with Type D personality, anxiety and depression in patients with MI in Pakistan. Social support was also identified as

a significant predictor of physical and environmental quality of life both at baseline (2-8 weeks of diagnosis MI) and 9 months follow up.

The results also revealed MI patients reported more symptoms of anxiety, depression (table 5-39) and impaired quality of life (table 5-42) at 9 months follow up as compared to baseline assessment taken within 2-8 weeks of diagnosis of MI. There was a minor increase (table 5.10) in percentage of Type D personality individuals at 9 months follow up (time 2). However in the current study, Type D personality was established as a stable personality trait in MI patients over the period of 9 months. MI patients were consistently classified as Type D or non-Type D at baseline and 9 months follow up. It was also evident from the analysis that majority of MI patients persistently reported low level of social support both at time 1 and time 2 assessments (table 5-40 & 5-41).

This study has enhanced our understanding and added to the knowledge base. Analysis of mortality data revealed that all those patients who died during the 9 months follow up were characterized as Type D, scored high on anxiety depression, and low on level of social support. The result supported the research evidence that MI patients, especially with Type D personality and low level of social support, are more prone to anxiety and depression which would subsequently contribute to adverse cardiac outcomes such as impaired quality of life and mortality.

The research findings also suggested that despite the cultural differences, these results are consistent with studies conducted in other countries indicating that psychosocial variables such as Type D personality, anxiety, depression and social support have a significant association with post MI quality of life across diverse cultures.

In view of the above mentioned results, Type D personality, symptoms of anxiety and depression need to be considered in the risk stratification and treatment of post-MI patients. Therefore, comprehensive self-reporting tools, such as DS-14 and HADS should be provided in primary health care settings and hospitals for the screening and assessment of Type D personality characteristics, anxiety and depression in these patients. This would be helpful in identifying the patients in need for psychological interventions and counseling referral.

6.15 Recommendations for future research

Further research studies should be carried out to explore if the findings of the current study are robust and replicable.

In the current study a considerably high percentage of MI patients were identified with Type D personality traits. Type D personality was also identified as one of the significant predictor of quality of baseline and follow up assessments. In view of the results of the current study and research evidence from western countries on the relationship of Type D personality with adverse health outcomes in cardiac patients, it is important to explore the etiological and prognostic implications of Type D personality in cardiac patients in Pakistan.

Future studies should take into account possible physiological (cardiovascular reactivity, elevated catecholamine levels) and psychosocial mechanisms by which these psychosocial variables (Type D personality, anxiety, depression & social support) may lead to adverse outcomes (mortality, morbidity & impaired QOL) in cardiac patients.

In the present study only first time diagnosed patients of MI were selected while assessing the predictors of quality of life outcomes. These psychosocial variables should be assessed in other cardiac groups for predicting specific outcomes in patients with different cardiac diseases such as patient with coronary artery disease (CAD), chronic heart failure (CHF), coronary-artery bypass grafting (CABG), cardiac arrhythmias, acute coronary syndromes (ACS) and other related conditions.

Variables such as illness perception, coping skills and resilience and their impact on cardiac outcomes such as mortality, morbidity and quality of life, should also be examined in future research.

In the current study quality of life was the main outcome variable explored however, studies should include other outcomes such as mortality, morbidity, functional outcome and medication adherence in MI patients within the Pakistani population.

Future studies should also consider the etiological role of depression, anxiety, lack of social support and impaired quality of life in the initiation of a coronary

heart event such as MI. It is very important to explore various therapeutic approaches and cardiac rehabilitation programs for the management and treatment of patients with Type D personality traits, high level of psychological distress and low level of social support.

The study also highlighted the importance of social support as a significant predictor of quality of life. Studies should look in to the robust impact of social network and relationships on health. Further studies should be conducted to investigate the role of social support as a therapeutic intervention for the management and treatment of psychological distress post MI.

6.16 Clinical and therapeutic implications

The following part of the chapter explains some of clinical therapeutic implications for managing the impact of psychosocial predictors and improving quality of life of patients post MI.

Personality traits such as Type D personality are often neglected in the assessment and management of patients with MI. Research evidence (Versteeg et al., 2012; Williams et al., 2011a; Denollet et al.,2010; Martens et al., 2010) have shown that Type D personality have adverse impact on the course, treatment and prognosis of cardiac diseases. Given this, it is important to take steps to help alter the Type D personality style in MI patients as, despite having consistent and stable personality traits, personality styles can be flexible, and people are resilient given the right support such as being helped to practice relaxation and stress management.

According to Nyklieck et al. (2012), current clinical and therapeutic interventions lack specific strategies to target Type D personality traits in cardiac patients. They explored the impact of Mindfulness-based stress reduction (MBSR) on Type D personality traits in a randomized control trial.

Mindfulness-based stress reduction (MBSR) can help patients develop an awareness of feelings and attitudes. It is an approach developed by Jon Kabat-Zinn, a molecular biologist who studied mind-body interactions. He developed MBSR as a stress-reduction program for patients at the University of Massachusetts Medical School. MBSR has been quite effective in helping patients suffering from a variety of medical problems. The principles of mindfulness include adopting a nonjudgmental attitude toward self and others, being patient and compassionate, practicing acceptance and focusing on the present. In addition, a large part of MBSR is the development of skills for relaxation and focused concentration. MSBR has been shown to reduce anxiety and increase positive emotions. Nyklieck et al. (2012) reported that MSBR program has significant impact in reducing Type D personality characteristics by changing mindfulness. They (Nyklieck et al., 2012) claimed that this the first intervention study conducted to provide research evidence for reduction in Type D personality characteristics with the help of psychological therapeutic interventions. Future studies should evaluate the effect of reducing the Type D personality characteristics and its prognostic impact on quality of life of MI patients.

Other therapeutic strategies and techniques may also contribute in reducing the negative impact of psychosocial predictors and improving quality of life. Psychotherapy can be a safe setting where feelings can be private and confidential, and help people develop the skills for self-expression. Research evidence (Pelle et al., 2012) has also suggested that behavioral techniques may play a significant role in enhancing the coping strategies to deal with psychological distress in cardiac patients with Type D personality.

6.17 **Theoretical Implications**

This section considers the extent to which the above findings are consistent within the Ferran's (2005) revised quality of life model of Wilson and Cleary (1995). This section aims at discussing the findings of the current research in the light of above-mentioned theoretical framework. It is of particular significance to identify the specific sociodemographic, clinical and psychosocial predictors, which fits within Ferran's (2005) Quality of life model.

The speculative diagrams of proposed model for predictors of quality of life and the adapted model based on the identification of significant predictors (demographic, clinical and psychosocial) in the present research are shown below as Figure 6.1 and 6.2 respectively.

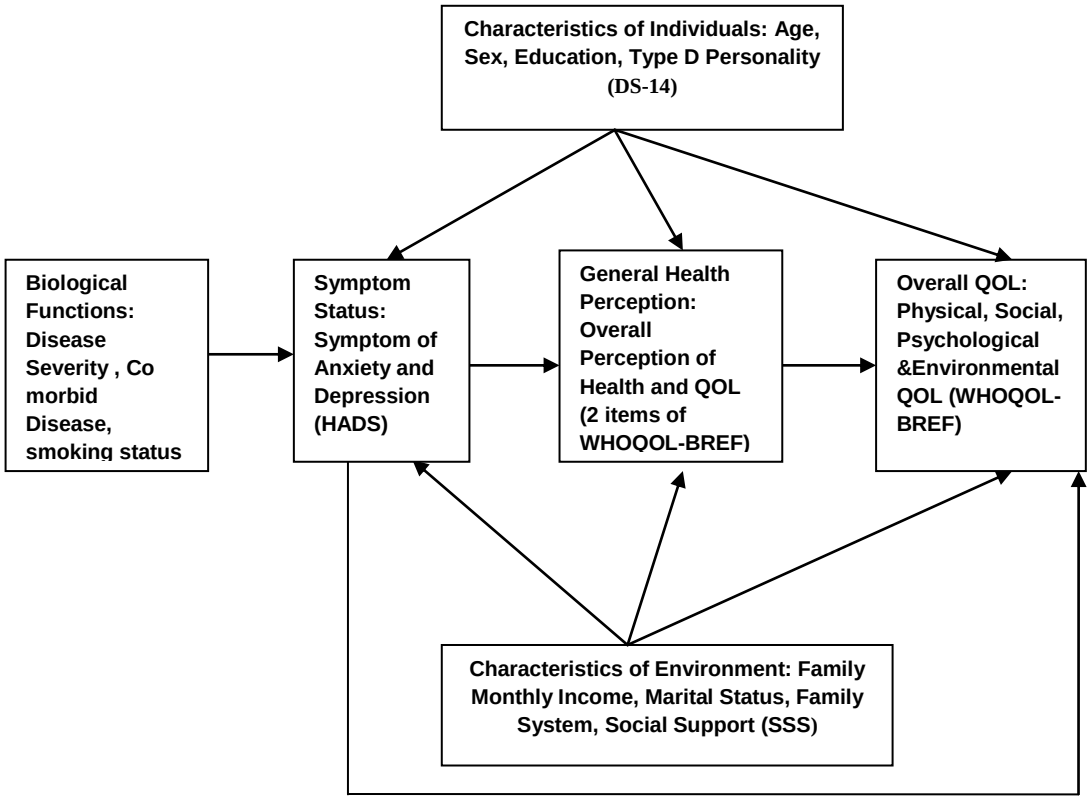

Figure 6-1: Proposed models for predictors of quality of life in MI patients

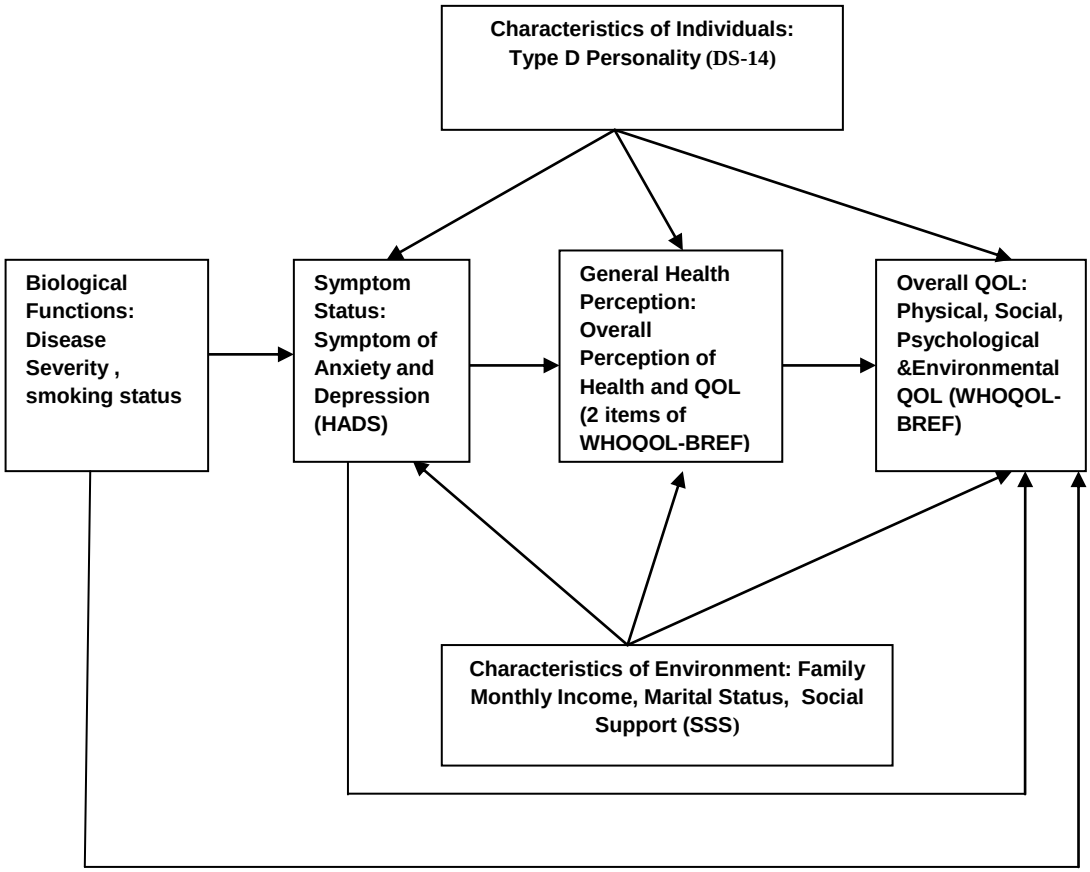

Figure 6-2: Adapted model based on significant predictors of Quality of life in MI patients

In the past few decades the research on quality-of-life has increased in rigor to better understand its complexities. The quality of life is a multi-dimensional aspect and influenced by number of factors which include symptom presentation, personality, motivation, and value preferences, social and psychological support. The various aspects of quality of life which include

physical functioning, symptoms, psychosocial adjustment, well-being, life satisfaction, and overall happiness are vital components associated with health care. Besides there are many non-medical factors which are categorized as environmental factors. Dunning et al.(2005) conducted one of the largest prospective cohort study to assess relationship of coronary artery bypass with survival and quality of life. Findings showed that smoking, female sex, co-morbid disease and some other health related factors were significant predictors for poor quality of life. Depression and anxiety have been identified as important determinants of quality of life in MI patients (Stafford et al., 2007; Benyamini et al., 2013). Four year follow up of patients by Graham et al. (2006) showed that quality of life of patients with proper care can be improved in cardiac patients. Present study findings incorporated physical, psychological, social and environmental aspects of quality of life outcomes in MI patients thus provide guidelines for appropriate care, management and rehabilitation of these patients. Keeping in view the shifting face of health care worldwide it is important to understand the psychosocial factors along with biological components of cardiac diseases which can have an impact on the outcomes of treatment. Health related quality of life is not homogenous for the physical and the mental dimensions in cardiac patients. To achieve better treatment outcomes it is important to value well-being. In this context it has been asserted by health professionals that assessment of HRQOL is an important predictor of treatment outcomes. The Quality of life has physical, psychological, social and environmental components thus it is important to assess physical activity, mental status, emotional status and independent functioning to plan treatment

for cardiac patients. Role of HRQOL of life in patient is also related with patient satisfaction with the treatment outcomes. Also promoting healthy aging and use of complex interventions to delay frailty and disability are increasingly adopted by international healthcare systems to control negative health outcomes in patients with cardiac diseases.

As elaborated in earlier chapter on theoretical models, the modified version of Wilson and Clary's model i.e., Ferrans et al. (2005) model on HQOL informed the findings of the current study. Relating to the objective of the study, main aim was to identify set of psychosocial predictors related to quality of life. As predicted by the model, significant correlations were observed between demographic variables such as marital status and education level, clinical variables such as severity of illness, anxiety, depression, social support, Type D personality and quality of life. The nature of association between study variables is presented in the fig 6.1. According to the model, various components including psychosocial variables, symptom status, functional status, general health perception, characteristics of individual and environment play pivotal role towards overall quality of life. A multidimensional interaction between these variables can help to explain how quality of life is influenced by psychosocial and environmental characteristics. As the model identified the role of personality traits, it was shown through this study that Type D personality significantly predicted quality of life. Moreover, clinical symptoms such as anxiety and depression appeared to impair quality of life.

The model reflects that quality of life is influenced by interaction of multiple variables. Depression emerged as a strong predictor of impaired quality of life on all domains. Studies have shown that elevated levels of depression in cardiac patients may be attributed to lack of proper treatment and adherence to the treatment (Carney & Freedland, 2008). There is a growing evidence to suggest that Type D personality can also cause escalated levels of anxiety and depression (Lichtman, et al., 2008). Role of demographic characteristics such as marital status, family system and education level cannot be negated as far as quality of life is concerned. The findings of the present study suggested that marital status and education level predicted overall quality of life. Studies have shown that married individuals have report strong social support and therefore have comparatively better quality of life than those who are single (Kao et al., 2014).

Amongst the demographic variables, marital status and family monthly income appeared to influence physical and environmental quality of life respectively at time 1. However this influence was minimal/non-significant at time 2. For the clinical variables, MI severity and smoking status predicted physical and social/environmental quality of life. Depression was identified as strongest predictors influencing all four domains of quality of life at time 2. The Ferrans's (2005) model appears to fit well within the present study, with depression as a major contributory factor. These findings support the model which states that an interaction of multiple variables across span can influence one's quality of life. Finding of the present study indicating depression and Type D are major

determinant of poor quality of life are consistent with the findings of other studies which have shown that both depression and Type D were determinants of poor quality of life (Mols et al., 2010; Kupper et al., 2013) in cardiac patients.

Social Support also influence physical quality of life appeared to be influential in time two assessment where its impact was equally statistical with that of depression and Type D personality. The influence of social support for time one assessment was non-significant. Literature on social support has suggested that low social support over period of time may be because it is less useful in coping from psychosocial issues (Hofer et al., 2004).

In nutshell, the findings of present study provided potential support for the use of the Farren's (2005) model of HRQOL in Pakistani culture. The findings of present research also enriched the theoretical understanding of HRQOL and offer guidance to healthcare professionals with regard to role of individual, social and environmental factors in determining the health-related quality of life. Targeting personality traits (Type D personality) and some modifiable symptoms such as depression and anxiety will ultimately improve quality of life in persons with coronary disease. The Ferran's (2005) model with little adaptation in terms of Types of individual and environmental factors is useful as it fill the gap by linking health-related with socially and environmentally identified variables. Therefore, this study has clear theoretical and clinical applications as the findings indicate that sociodemographic factors biological/physiological factors, personality, psychological (depression and anxiety symptom) and environmental

factors(social support , marital status, family income) play important roles in the outcome of different domains of quality of life in MI patients.

6.18 **Conclusion**

This section concludes the discussion in the light of current findings with special reference to Pakistani population.

Immediately after the diagnosis of a life threatening condition such as Myocardial Infarction, people go through the period of emotional turbulence. The diagnosis is an enormous shock for the patient and the family. Some patients experience extreme fear that myocardial infarction might have killed them. This fear is followed by range of emotions such as denial, anger, sadness and anxiety. All are common reactions to this traumatizing experience. Social and emotional support from friends and family, reassurance, proper information and education about heart disease at this period of emotional adjustment should be the initial intervention. However if the patient remains anxious and depressed , has sleep disturbance and difficulty resuming daily activities for the period of 2 weeks or even after the discharge from the hospital, the specific assessment of anxiety and depression should be considered . Patients, who are identified with Type D personality characteristics and significant symptoms of anxiety and depression, should be immediately referred for proper treatment and individualized cardiac care (Denollet et al., 2010) based on the assessment of personality traits and level of distress. If left untreated psychological distress (anxiety & depression) imposes a serious psychosocial burden and medical

rehabilitation and recovery are impeded. Furthermore anxiety and depression itself are likely to become chronic. Depression is important in and of itself because of the very considerable suffering it imposes. But it also exacerbates, prolongs and amplifies cardiac symptoms. Coronary heart disease patients with depression have more severe symptoms than non-depressed patients, have greater risk of impaired cardiac events (Meijer et al., 2011) and are less likely to comply with medical/ treatment therapy (Williams et al.,2011). This is detrimental to cardiac rehabilitation programs.

Unlike the expression and management of physical ailment, mental illness is strongly influenced by cultural perspectives. In Pakistan, for example, expression of grief, worry or depression is influenced by the availability of immediate support group i.e., family or friends rather than professional mental health support. This expression is different for men and women. As it has been indicated sparingly across this thesis, social support is a strong mediator towards healthy recovery after experiencing MI. The presence of a strong, supportive and caring network of people shares and elevates the level of distress that might come as a result of diagnosis of MI. In the present study, the majority of participants were attended by their family members particularly including children and spouse. Other cultural factors might include, nature of responsibilities being borne by the patient, financial situation, mobility, availability of recreation and similar activities and most importantly a supporting family.

In Pakistan there is a strong network of joint and extended family systems where parents, children and grandchildren either live together (joint family system) under one roof (Orenstein, 1961) or in a network of relatives closely bonded in an extended family system (Jafar 2003) . Research studies (Assad 2004; Itrart, 2008; Bashir, 2009) have suggested that majority of people in Pakistan still live in joint or extended family systems. Member of extended families may play a supportive role especially during stressful events (Jafar 2003). Although in the current research, family system was not identified as significant predictor of quality of life, it is still important to incorporate social support from family and community as a part of intervention plans for cardiac rehabilitation. A strong network of social ties and relationships, if utilized in an appropriate way, would have a significant impact/ influence on the treatment and prognosis of MI patient living within such social context (Pakistani society).

It is important that people diagnosed with MI should have meaningful social network with other individuals. Significant others like, spouse, relatives and friends are trained or educated to provide social support in a way which would be beneficial for management, treatment and rehabilitation of these patients.

In Pakistani culture, a strong family system plays a crucial role in the life of Individuals. Social support may be used in cardiac rehabilitation as an intervention tool to treat anxiety and depression, in patients suffering from myocardial infarction. Social relationship and ties should be promoted in a way that it would be beneficial to health. It should develop a sense of attachment, social integration, reassurance of worth, sense of belongingness, nurturance,

and reliable alliances, the six different social functions described by Weiss (1974) that may be obtained from relationship with others. Family members /friends may be trained to provide appropriate support, even more so within the Pakistani culture, where there is a strong network of social ties with family and friends who are considered as a source of social support in stressful situations. This would subsequently improve the quality of life of these patients.

It's very important that physicians should be aware of personality characteristics and its association with psychological distress (anxiety & depression) and social support (perceived & received) in the management and treatment of MI. Therapeutic interventions should be based on an eclectic approach keeping in view the personality characteristics and sociodemographic settings of the patient. Assessment of Type D personality, level of anxiety, depression and social support should be the first step.

It is essential to explore which kind of support plays a significant role and is associated with heart disease. Whether it's the functional (support provided by the social network) or structural support (characteristics of the social network), the way support is perceived is very important (Barth et al., 2010). Both structural and functional supports depend upon the perceived social support, which is the cognitive appraisal of availability and quality of support. MI patients having Type D personality and high level of depression and anxiety have difficulty in perceiving the support even if it is there. Therefore providing support becomes a very difficult task for friends and family. A strong network of family and friends is crucial for reducing symptoms of anxiety and depression and

improving quality of life of patients recovering from cardiac diseases (Barutcu & Mert , 2013: Vinod & Christopher, 2014).

Psychosocial factors such as Type D personality characteristics, anxiety, depression and social support are interlinked in the development, course, treatment and prognosis of MI. Understanding the association between these psychosocial variables has important implications both for social policy and clinical practice.

Lack of adequate social support (perceived & received) may cause psychological distress such as anxiety and depression in patients following a myocardial infarction. Another underlying factor i.e Type D personality which is characterized by negative affectivity and social isolation would further negatively affect the perception about social support. Type D individuals have a pessimistic attitude and tend to perceive the behaviour of other in a negative way. They also react more negatively toward others (Sararoudi, 2011).Therefore MI patients with Type D personality tend to feel less supported and also receive less support from others. Type D patients are more prone and susceptible to negative emotions such as anxiety and depression. Therefore the association of all these psychosocial factors can have adverse effect on quality of life following a myocardial infarction. Barth et al. (2010) in a review on lack of social support in the aetiology and prognosis of coronary heart disease (CHD) emphasized the importance of a positive impact of perceived social support in the development as well as the prognosis of CHD. Since social isolation is deleterious to cardiac patients, it was suggested therapeutic strategies should be devised to identify

and monitor patients with low social support and limited social network. It is important that patients should be encouraged to optimize their social support (perceived & received) at every stage of their heart disease so that they would know what Type of support is best for them.

This is the first study conducted in Pakistan which has assessed a combination of multiple sociodemographic, clinical and psychosocial variables (Type D personality, anxiety, depression & social support) associated with MI and the affect of these variables on quality of life of these patients. The current study has open an avenue for significance of personality characteristics (Type D) in cardiovascular research in Pakistan.

In the past most of the research work on psychosocial aspect of cardiac diseases has been done on psychological distress such as anxiety and depression. The underlying vulnerability factor for the psychological distress (anxiety, depression) such as Type D personality has not been extensively studied. All these psychosocial factors may affect, adherence to medication, self-management and changes in lifestyles (smoking cessation, dietary habits, and exercise) which are mandatory for cardiac rehabilitation and prognosis in terms of impaired quality of life, future cardiac events and mortality.

The finding of the present research clearly emphasized to have a differentiated look on the role of psychosocial variables and its impact on cardiac related outcomes (quality of life, morbidity) in research on heart disease.